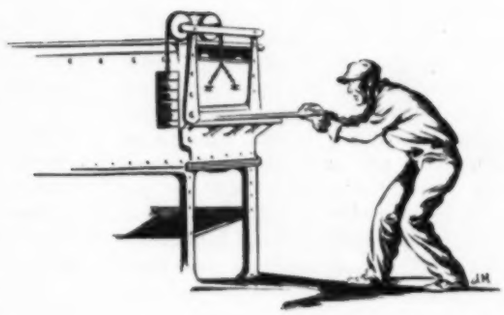
American Machinist

JULY 31, 1935



# *Distortion...*

# Its Prevention and Cure

E. F. DAVIS

*Chief Metallurgist, Warner Gear Company*

**The first of a two-part series tells how the composition of the metal and the method of heating and quenching affect distortion**

STRAIGHTENING of cambered or distorted steel parts, a familiar production operation, presents problems involving all our present knowledge of metallurgy. We cannot, of course, expect a steel hardened or operator of a straightening press to be a metallurgist; yet lack of understanding of the fundamental reasons for warpage and breakage in straightening has caused incalculable loss.

There are actually two phases of the straightening problem: first, prevention of warpage, and second, employment of means and methods which will minimize breakage. It is obvious that no straightening would be necessary if distortion did not occur. It is also apparent that the smaller amount of straightening required, the less will be the hazards of loss when an attempt is made to restore steel to its original shape. Therefore, the greatest concentration of effort should be toward avoidance of warpage.

Warpage is produced by strains. The effect is internal, but the cause is external. Strains are developed only when steel is prevented from functioning in accordance with the natural laws of expansion and contraction as it is heated or cooled.

If we select a bar about 12-in. long and rapidly heat one side of its length, it will form a bow, because the heated half will expand faster than the other. If we constrict it so it cannot move longitudinally and then heat the bar in the center, it will become snaky in contour. This has often been exemplified when furnace rails in pusher type furnaces have been anchored at both ends, preventing them from expanding when the furnace is brought to heat. If we lay a cold bar on a hot furnace floor without rolling it as it heats up, it will camber.

The type of furnace used is all important. Uniformity of heating, care given to preheating, method of applying heat by convection or radiation, flatness of the furnace hearth are all factors in the movement of metal during heating. Often heating in a liquid medium such as molten lead or cyanide will enable steel to come out straighter than in an open furnace because the steel is surrounded by a fluid medium of uniform temperature, and no section of the piece, whether thick or thin, can attain a temperature in excess of the bath itself.

But the major distortion does not occur during heating of steel unless hardening methods are grossly irregular. Under normal conditions, steel expands during heating with little opportunity for strains to be developed. An exception to this may occur when

strains are already in the steel such as occur from forging, severe cold working, heavy machining or when the steel has not been properly normalized prior to hardening. Cold-drawn steel usually distorts more than hot-rolled steel because of the strains developed in cold drawing. This is exemplified by the tendency of cold drawn steel to shorten when it is straightened.

The worst cambering action almost invariably develops during quenching because the metal, when heated to the hardening temperature, is soft and plastic and, being expanded by temperature, is already in a sense distorted from its original dimensions. The quenching to be performed properly must harden the steel and in addition restore it to its primary shape. A steel having a tensile strength of 150,000 lb. per sq.in., when hardened, will scarcely exceed 18,000 lb. per sq.in. when heated to 1,450 F. A steel of 75,000 lb. tensile will not have much over 5,000 lb. strength at the same temperature. The initial yield values will be correspondingly lowered.

### Where Distortion Starts

When we quench this weak plastic and expanded steel, we are at the same time shrinking and converting it in a few seconds to a dense strong rigid body; hence slight differentials in cooling rate become quite important in stress development. Projections such as flutes, teeth, collars, splines and flanges often obtain rigidity before the body of the piece itself, and these become the nuclei for strain cambering. Thus, if one thin section has cooled to a tensile strength of 125,000 lb. per sq.in. and an adjoining large section is at a tensile strength of 20,000 to 30,000 lb. and still contracting, high internal stresses may be developed between the two sections and a cambering caused at their junction.

When heated steel is placed in a quenching fluid, the thermal units are carried away as fast as they can be radiated by the heat conduction of the metal into the surrounding quenching medium. In order to obtain the necessary hardness, it is essential that the temperature drop be rapid. This rate must be increased when the metal mass is great, because there are more heat units to be dissipated, and may be reduced when the volume of steel is small.

During this quenching, new microconstituents form, which are not present while the steel is being heated, intrude themselves into the steel matrix, occupy variable volumes and, in so doing, produce internal strains. It has been estimated that nearly a third of the hardness increase in heat-treatment is caused by interstraining of the crystal line lattice within the metal by arrested constituents such as martensite and troostite. We may thus regard hardened steel as internally stressed steel. We may well understand the magnitude of these stresses when large masses of steel having tensile values up to 200,000 lb. per sq.in. will sometimes shatter after quenching and occasionally subsequent to tempering.

The rapidity with which steel hardens is governed by the temperature of the steel at the moment it enters the quench, the mass or body of metal, the viscosity and temperature of the coolant, the kind of coolant and its specific heat. The faster the heat is removed, the greater the danger of inequality in cooling and, therefore, the development of the mass strains which produce the camber. This is why water-quenched work always distorts more than oil-quenched parts and brine-cooled steel more than either of the foregoing.

Fast cooling is also said to reduce the temperature of the formation of martensite which is likely to increase internal strains yet reduce the hardness. With slower cooling, the martensite transformation occurs at higher temperatures with an improvement in hardness. If more slowly cooled, a mixture of martensite and troostite may be produced or the austenite may be converted directly to troostite. The important thing is that all these differences, which represent only a few seconds' variation in cooling speed, give us our degrees of hardness and density. Accordingly, the stresses are at a maximum or minimum depending upon the constituents in the crystal lattice. These items are all factors in straightening, for they directly affect the ability of the steel to be straightened without breakage.

The obvious thing to do is to slow down the quenching speed so that sufficient hardness is maintained and thus avoid excessive stresses. This may be done by lowering the temperature of hardening, reducing the amount of agitation in quenching, by using hot water instead of cold or by changing the type or viscosity of the cooling fluid. In other words, avoid over-quenching whenever possible.

It is not always possible to cool as slowly as desired because hardness is usually important. Often the volume of the metal in the part is so great that brine or caustic soda quenching is necessary to speed up the cooling rate so that the desired hardness may be assured. But there are often means whereby cooling may be allowed to proceed slower and correct hardness still be maintained. In a carbon steel, an increase in carbon or manganese, or the mere changing from a shallow hardening to a deep hardening type, will enable milder quenching. All steel mills are able to furnish either grade. The offense is that too frequently the fact that the part must be afterwards straightened is never given sufficient attention in the selection of the steel itself.

Distortion is often caused by flowing currents of the coolant from a pump in the cooling system, from the convection currents of other parts being simultaneously quenched or induced by the currents formed by the piece itself. It is sometimes caused by a steam pocket or halo being formed in the various recesses of the part, preventing the quenching medium from contacting the metal surfaces and producing a uniform effect of the quench.

Incorrect entry of the piece into the quenching fluid is often a cause of cambering. If we quench a flat disk, such as a milling cutter, flat into water the turbulence set up causes flow of quenching fluid at the bottom with an increase in velocity on the sides and slower action on the top face due to an eddy being formed. With this difference in cooling velocity, distortion will certainly occur. If a cylindrical bar is laid horizontally in the bath the same effect may be noted. If, however, the cutter or cylinder were quenched vertically or allowed to rotate vertically or even horizontally, the quenching effect would be equalized.

### Parts Whirled When Quenched

Shafts or cylindrical pieces if given a whirling motion always have a much better chance of coming straight than when quenched by an up and down movement, which is the conventional way of quenching shafting. Even though the shaft enters the quench horizontally, it will not be as likely to camber if it is revolving. A simple way of doing this is to roll the shaft down an incline pitched at an angle of from 40 to 50 deg. After removal from the furnace, it is laid horizontally on the inclined plate and allowed to roll into the coolant. In doing so it picks up enough spinning velocity to enable it to quench with little or no camber. I have done this for a number of years on cylindrical shafts with excellent results, and this is a

regular production process for countershafts and rails.

Another method employed in some plants for hardening long shafts, such as camshafts, is a hardening cage provided with a small motor and rotating mechanism. The shaft on removal from the furnace is placed in a cradle provided in the cage. The cage is closed and clamped to hold it rigidly in place. The motor is started to rotate the shaft and the cage and piece are immediately lowered into the quench.

Die quenching for ring gears, bearing races and thin disks is frequently practiced. The parts are held during the quench in rigid dies, and streams of quenching oil are forced by pressure into the dies. When disks are hardened, they are placed in water jacketed dies. Thin disks requiring a spring temper are often straightened by compressing between electrically heated plates which temper and straighten simultaneously.

The type of steel selected has an important bearing on distortion and the ability to straighten without breakage. The ferrite grain is capable of a great amount of plastic deformation before failure; hence, very low carbon steels, which are largely ferritic, offer no serious obstacles to straightening. Wrought iron and the carburizing grades of carbon and alloy steels may be easily straightened. The increase in carbon content introduces hard brittle carbides into the steel and reduces the plasticity of the ferrite, for a considerable percentage of the ferrite combines with the carbon to form the carbides.

There is little advantage in selecting a carbon steel which must be quenched by violent agitation in water when increasing the carbon content or substituting a mild alloy steel it enables us to quench in oil. For example, a carburizing grade of steel with only 0.5 per cent nickel may be readily quenched in oil and a file hard surface obtained, whereas the same steel without nickel must be hardened in water with a marked increase in distortion due to the necessity for a more drastic quench.

Alloying elements strengthen the ferrite matrix, raise the yield and tensile values and add or detract from the steel's straightening properties. Manganese and silicon, for example, detract from the ease of straightening. Vanadium improves the straightening properties; also nickel and molybdenum.

The coarseness or fineness of grain is of great importance. Inherently coarse-grained steels are usually difficult to straighten without breakage, even when the carbon is low. This is not entirely caused by grain size, but the coarse-grained types are deeper hardening and, therefore, more brittle. As a general rule the finer the grain size, the less the danger of breakage in straightening. In recent years, more has been learned by steel metallurgists of the control of grain size, and definite ratings have been adopted; most steel manufacturers are able to produce almost any grain size desired in accordance with the A.S.T.M. rating. It is frequently the practice to specify the finer or intermediate grain sizes from No. 4 to 8 for shafting and similar applications where straightening is essential.

Steels which are coarse-grained, due to overheating in forging or annealing or prolonged carburizing, are likely to be brittle in proportion to the extent that the steel has been mistreated or weakened by excessive temperature. Steels which have been unduly cold worked and then subjected to low temperature heating often show excessive coarseness of grain and brittleness.

Incorrect forging practice, such as the production of the wrong direction of grain flow, is often a cause of excessive distortion. Steels move most

in the direction of the fiber and least against the fiber. Forgings with equiaxial fiber produce the best condition for minimizing movement due to quenching strains.

In the carburizing steels the relation of case depth to core is quite vital. At least three times as much core to case cross-section should be the rule, if straightening is to be effected. The carbon in the core should not exceed 0.20 per cent and the hardness of the core should not exceed 300 Brinell, and preferably less. Excessively high carburizing temperatures should be avoided. A maximum of 1,700 F. is a good limit. High temperature carburizing piles excessive cementite on the outer carburized layers and causes spalling and cracking of the case when straightening is attempted. Also high temperature carburizing has a coarsening effect on the core, all of which increases brittleness of the piece. Carburized work quenched from the box usually straightens better than work cooled in the box. The reason for this will be explained later.

## Some Must Be Annealed

Some steels are almost impossible to straighten after hardening; among these are the high manganese eutectic types known as oil-hardening tool steels. These steels having deep-hardening characteristics, become brittle and do not lose their brittle properties even when heated up to 1,000 F.; hence they cannot safely be straightened. Fortunately, they quench out with well balanced stresses and seldom distort from an oil quench. Steels of this type should be annealed, restraightened and rehardened, for it is futile even to attempt any corrective straightening in the heat-treated state. The same is true of other brittle types.

A considerable tonnage of steel is used for various types of shafting. These steels range from 30 to 50 per cent carbon. The principal analyses are SAE specifications Nos. 1030, 1040, 1045, 3140, 3145, 4130, 4140, 4640, 5140, 6150.

Steels below 35 per cent carbon are usually quenched in water, but all others are quenched in oil. To improve the oil-quenching properties, steels with higher silicon and manganese are often specified. For water-quenching, fine-grained steels or low manganese and silicon steels are recommended, but for oil quenching, the higher silicon and manganese steels improve the hardness and minimize the distortion which occurs in water quenching.

Steels of the preceding types should be straightened before the tempering operation. Shafts up to 0.20-in. per ft. camber may be straightened without breakage if this operation is performed directly after the quench. These steels after quenching possess varying degrees of residual austenite and trootite. In straightening parlance, the steel is "dead." After the temper, the elastic properties are more highly developed, probably due to the elimination of austenite. The shafts then acquire a springiness which makes straightening difficult. I use this method in regular production straightening.

*The second and concluding part of Mr. Davis' article will appear soon.*

*Boron paste is spread to an even thickness over the surface to be processed, and then the parent metal is brought to a sweating heat with an oxy-acetylene torch*

# HARD-FACING with BORON

MILES C. SMITH

**Through its very simplicity a new method of hard facing ferrous metal objects, developed by Norman W. Cole of Los Nietos, California, offers great promise. The material is boron in crystal form, and it is applied to ordinary low carbon steel or iron by either of two methods, sweating on or casting on**

BORON crystals and borides are not new to the welding industry or, in fact, to metal smelters and workers, but utilizing them to form a successful wear-resistant, corrosion-resistant surface is new. Furthermore, the sort of surface formed and the method of application is quite as novel as the material employed.

Although its inventor has prepared this substance so that it may be used and applied in several different ways and forms, the metal-working industries in general should be most interested in and most concerned about that particular material which, for want of a better name, Mr. Cole has termed his "Sweat on." Machinery builders and users will also be interested in another ramification of the same base substance which we shall term "Cast on."

"Sweat on," as the name implies, is applied by bringing the surface of the parent metal to a sweating heat when the boron crystal preparation in finely divided form (60 mesh or finer) congeals with the parent metal surface to form a level, abrasive-resistant, corrosion-resistant, heat-resistant skin.

"Cast on," on the other hand, is heated up and poured to fill whatever space there may be between an easily constructed mold and the parent metal part to which it is applied. This method forms a layer or shell that is solid and firmly amalgamated with the parent metal, and which may be ground to a highly polished surface.

Boron crystals are relatively light. The specific gravity of the "Sweat on" crystals is approximately two-thirds that of mild steel, yet their hardness is about 9 on Moh's scale, and they are not readily attacked by the usual corrosive agencies.

But it is not alone the hardness of the crystals nor their resistance to corrosion which gives the "Sweat on" process its unusual efficiency. Other hard facings in use today consist of a continuous mass or shell of wear-resistant material that is welded to or amalgamated with the parent metal, while in the "Sweat on" process the crystals do not fuse or amalgamate with each other to form a solid mass. On the contrary, the outer skin of the parent metal to which "Sweat on" has been applied becomes impregnated with myriads of tiny, hard, wear-resisting and corrosion-resisting particles that are solidly attached to the parent metal, yet do not hamper any further heat-treatment of or working of the parent metal. As the parent metal expands or contracts, or is hammered out or formed, each crystal travels along with the unit of parent metal to which it is attached and remains unchanged and ready to function.

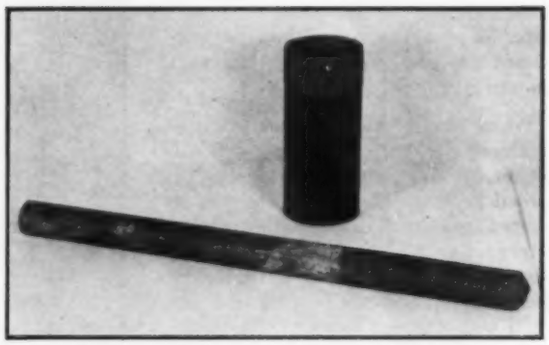
In contrast to the "Sweat on" the "Cast on" does form a solid mass and fulfills the requirements of the machine or equipment fabricator who must have a corrosive-resistant, wear-resistant surface that is absolutely solid, ground and polished. The "Cast on" has an average hardness of 58 on the Rockwell C scale or about 545 Brinell, but it derives its exceptional resistance to abrasion from its inherent toughness. As the microphotographs of its structure show, this particular "Cast on" material possesses an unusually dense structure that will resist the rupture of one molecule from another.

Undoubtedly, though, it is the "Sweat on" which will have the greater appeal and which can be responsible for the greater economies. It can be applied to ferrous metals of any analysis, shape or thickness. It can be applied to vertical as well as horizontal planes. In fact, it can be applied overhead, should such application be necessary. All that is necessary is to make a stiff paste of the "Sweat on" powder and a mixture of sodium silicate (water glass) and water, then brush or spatula-spread a relatively thin layer of the paste over the surface to be covered. When the parent metal beneath the paste is brought to a sweating heat, the operation is complete.

Another method of applying the "Sweat on" is to bring the surface to be covered to a sweating heat and sprinkle or dust on the dry powder until the surface is covered to the desired thickness. But this method is, in a general sense, less economical, slower and not so sure to produce the absolutely level overlay that is most often required.

During the four years in which Mr. Cole has been experimenting, studying and perfecting his material and his processes, he has not only tested his own products under all maner of conditions but he has, as well, developed and tested out recommended treatments for the parent metal to which the "Sweat on" is applied so that both the parent metal and the wear-resistant overlay will give the best account of themselves.

For example, he has found that the "Sweat on" applied to relatively low carbon soft steel will protect that steel from corrosion or wear, yet it will not give a fraction as good an account of itself when such parent metal is left in its natural state as it will when case-hardened. The case-hardening prevents the small hard crystals from being driven back into the body of the steel and keeps them out where they may function to best advantage. But the case-hardening or carburizing must be done prior to and not after the crystals are applied. A generous covering of these crystals prevents the carbon from being driven into the steel and the recommended procedure is to carburize, apply the crystals, and then heat-treat for strength. The carburizing is not effected during the proper application of the crystals.

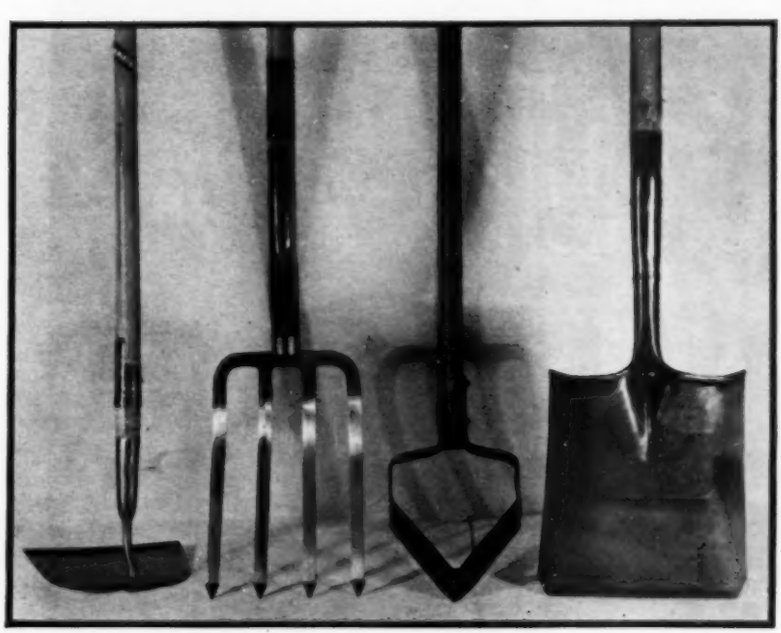


*The sweated-on overlay is smooth and continuous, as shown by the cylinder and thermal couple above*

Two, three or even more layers can be applied to the same surface, but the multiple layers do not increase the efficiency of the process in direct proportion to their number. The ideal application is a single generous layer properly applied, and this consists of slightly warming the metal before the paste is put on, so that there will be immediate drying, and sweating in with a neutral or slightly carbonizing oxy-acetylene flame. The flame is played upon one spot until the crystals lose their bright glow and then moved along, playing upon the crystals, as fast and only as fast as the bright glow is extinguished. The same procedure is used with a second or a third layer of the crystals, but the service from such multiple layers is not proportionately greater and the processing is slowed up after the first skin is deposited. Welded-on hard facings have their place in industry, so do cast-on overlays, but this new "Sweat on" process does fill a void that has been bothering the hard facing enthusiasts since first mention of the idea. For one thing, it permits the parent metal to expand and contract without fracturing or tending to cleave off the overlay.

Another useful phase is its successful performance when applied to relatively thin steel sheet. Carburizing boxes, for example, may be fabricated of sheet steel that has been processed with "Sweat on," and they will resist heat and corrosion almost indefinitely.

Then the overlay may be made to follow any surface contour. The boron crystal paste can be spread or brushed on to an even thickness over the surface, regardless of its shape or irregularities, and the crystals remain undis-



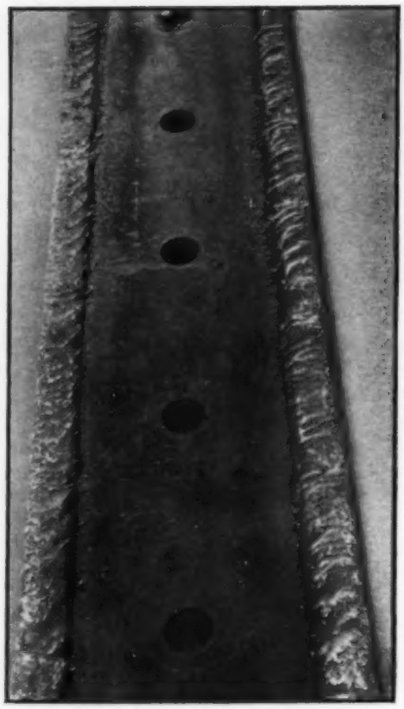
*Long life is imparted to garden tools by edging them with boron*

turbed during the sweating-on procedure, so that the resulting wear-resistant surface will follow the exact contour of the metal.

When the metal to be processed is of thick section, and if the part will permit, it is quite advantageous to spread the paste over the surface to be treated and then to place the part in a furnace to heat up to a low red heat when the part may be removed from the furnace, and the sweating-in finished with the oxy-acetylene flame. In that way, the amount of gas consumed by the torch will be considerably reduced and the cost of application proportionately cut down.

"Sweat on" may also be applied with the heat of the electric arc, but this method of applying entails considerably more care and, to date, has not been found sufficiently advantageous to be recommended over the oxy-acetylene flame method. Boron Crystals have a relatively high fusing point and are not readily changed or broken up by exposure to the heat of the electric arc. For this type of heat control and application, though, a gas flame is more pliable and the oxy-acetylene torch is easier to control.

Now, while this has been pretty much of a discussion of the method of application of one substance, because it has been with that single substance that the new methods mentioned have been conceived and perfected, it is really the new line of thought which should impress industry. To sprinkle a powder over a metallic surface and work it up into a wear-resisting mass with the heat of the oxy-acetylene torch or the carbon electric arc is not new. In the past, however, the powders used for such applications were puddled in with the parent metal to form a continuous mass, and such applications had disadvantages which this method overcomes.



*A welded-on facing is rough and irregular compared to that sweated on*

Likewise, many attempts have been made to cast on a wear-resistant or heat-resistant shell, yet past experiences have not been sufficiently encouraging to recommend the attempted procedures of the past for anything like general application. Heretofore, the wide divergence between the coefficient of expansion and contraction under heat and cold of the parent metal and the cast-on shell has resulted in no end of trouble and grief. The boron crystal preparation, on the other hand, seems to lend itself readily to such use, and experiences to date record no failures through strains set up by a difference in expansion and contraction coefficients when the "Cast on" process has been properly used.

But boron may not be the only element which will lend itself to such uses. Many years ago it was this author's privilege to describe the first successful material to be used for welding on a wear-resistant surface or overlay and now there are many materials for such a purpose. What industry should be especially interested in is the fact that a newly adopted substance has opened the way for the development of new processes and further economies. It is one more step ahead in the lowering of production costs for the fabricator and decreasing maintenance expense for the machinery and equipment user.

*Parts with boron cast on are wear-, corrosion- and heat-resistant*

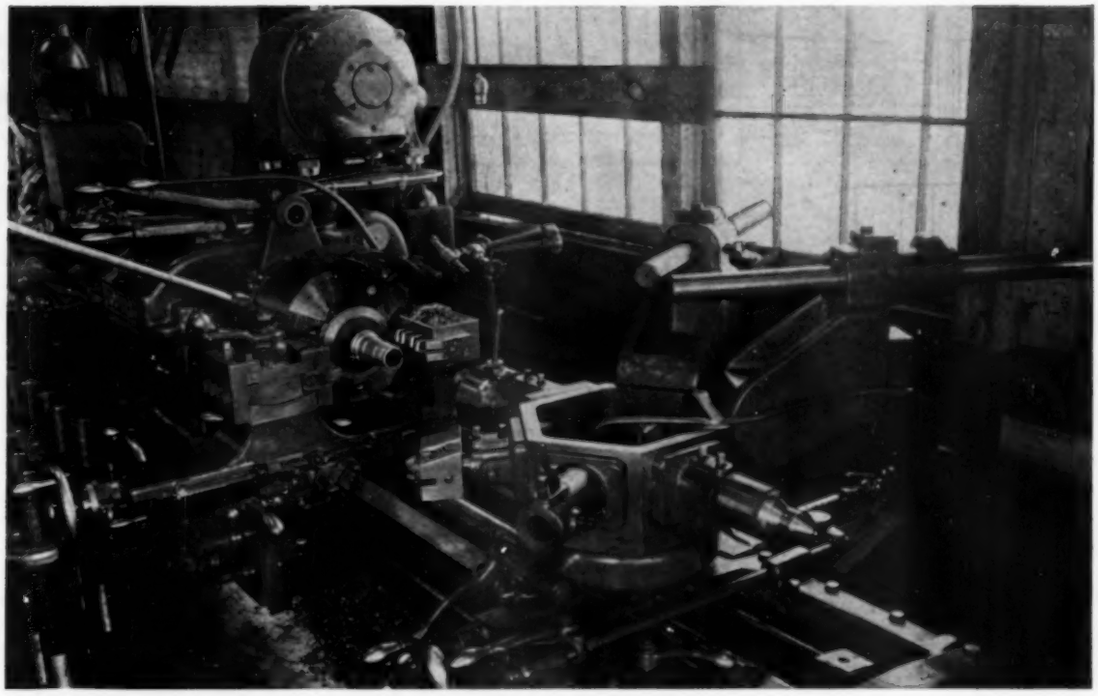


*Fig. 6—This turret lathe has been tooled to perform nine operations in end pieces for banjo housings*

# AUTOMOTIVE PRODUCTION on a JOBBING BASIS—II

**The second and final part of this article gives additional examples of the means used at the McKinnon Industries plant to maintain high efficiency despite wide variety of product**


JOHN HAYDOCK

*Managing Editor, American Machinist*


AS POINTED out in Part I of this article the Canadian import tax constitutes one of the many reasons why all U. S. equipment installed at the St. Catharines plant of the McKinnon Industries must be selected with more than usual care. A turret lathe, a heat-treating layout and a grinding machine chuck will be described to show how short runs on automobile parts are manufactured at costs competing favorably with those obtained in plants concentrating on one make of car.

Banjo housings for the rear axles of certain designs of trucks are composed of five parts welded together. The center portion is a steel casting, and the two outer ends, which support the wheel bearings, consist of a forged tube with a flange welded to it. For turning these end pieces, a Foster turret lathe has been installed, which performs an unusual variety of operations.

In the usual truck plant this work would be divided among two or more machines, but McKinnon's does not have the volume to keep more than one production unit busy, so it has selected a flexible method of tooling and a machine tool which will do all the work. One of the set-ups is illustrated in Fig. 6, with the work itself shown on the floor to the left. The spindle of the lathe is provided with a large enough hole to accommodate the work while it is being turned.

Before the flange is welded on, the work is held in a Foster-Barker chuck, a quick-acting work-holding device, mechanically operated since the hollow spindle construction does not permit the jaws to be actuated pneumatically or hydraulically. Before the chuck jaws are closed a plunger type pusher jaw in the first turret station, shown in Fig. 7, is used to force the work

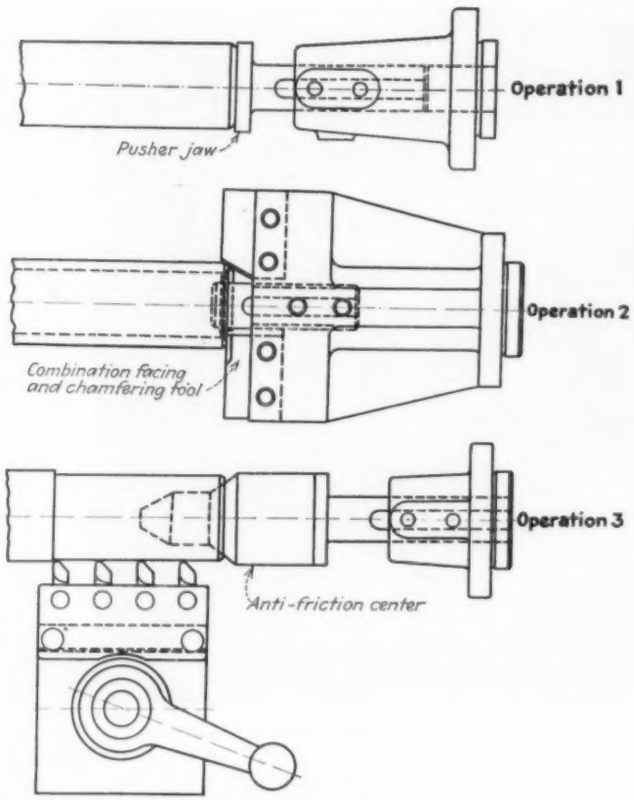



*Fig. 7—In the first chucking the end is turned and chamfered and the O.D. turned*

against a center located inside the hollow spindle.

A combination tool in the second turret station faces the end of the tube and chamfers the inside and outside edges. The third station supports the overhanging end of the piece by means of a revolving anti-friction center while a gang of four tools, held in the square turret, turns the straight portion of the end of the tube. By dividing the cut in this manner, the feed movement is held approximately a fourth of the length turned.

After the flange is pressed and welded in place, the piece is returned to the Foster lathe and chucked from the flange with the long end inside the spindle. Steps in the Foster-Barker chuck jaws permit this second chucking without additional adjustment. Again the end is faced and chamfered at the first turret station by the combination tool seen extending to the left in Fig. 6. For operation 2 of this set-up, the live center on the hexagon turret engages the internal chamfer just formed to give the work rigid support. Then, a gang of six cutters on the square turret rough turns all the stepped diameters on the tube.

These tools are backed from the operation 2, shown in Fig. 8, and are then traversed to bring cutter *A* into position for facing surface *B*. This cut is taken while surfaces *C* and *D* are being rough turned by a piloted gang of tools held in an overarm in the hex turret. A chamfer at *E* is also formed during this third operation.

In operation 4, all diameters except *C* are finish turned from overhead piloted tools mounted in the hex turret. Then another gang of seven tools mounted in the rear cross slide forms all shoulders and necks to the proper length and chamfers the large flange. The final operation consists of chasing the external thread with a self-opening die head.

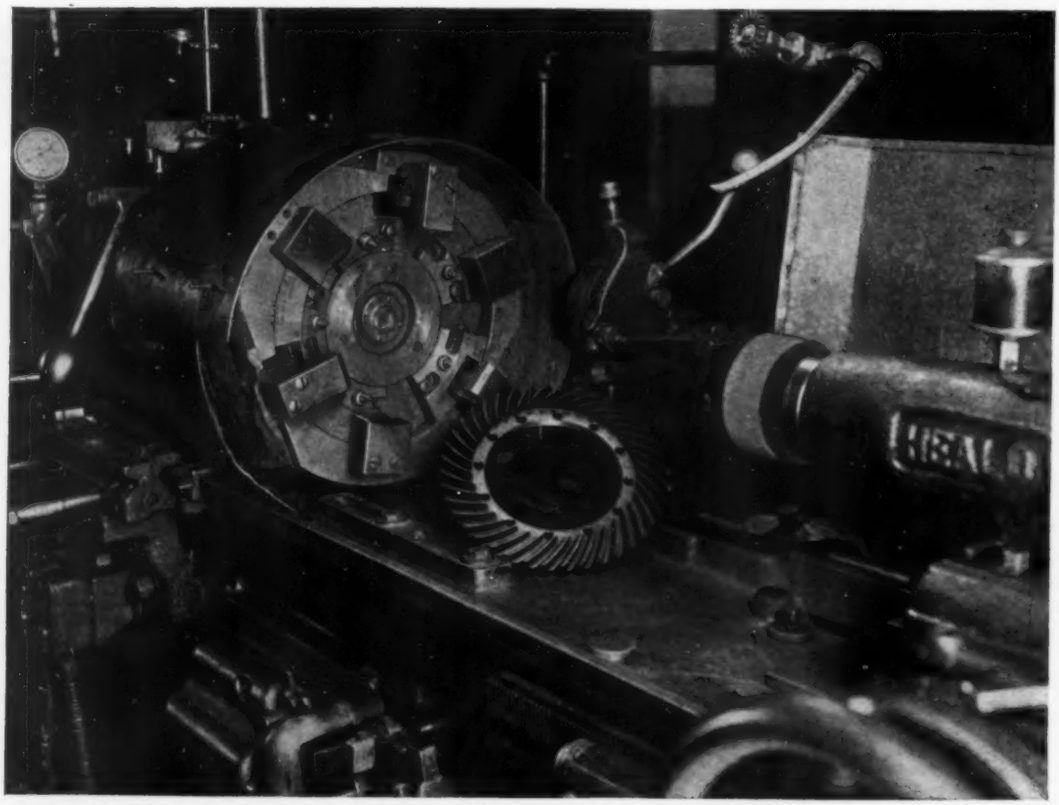


*Fig. 9—The size and position of the contact pins may be varied to accommodate a wide range of ring gears*

Heat-treatment of ring gears for the differentials at McKinnon is another example of the necessity of specialized practice to accommodate the wide variety of parts. These gears, of which there are 35 different designs are carburized and quenched, using Gleason quenching presses to prevent distortion. Since there are only two of these presses and 35 types of ring gears to be handled, it is necessary to make some provision for the changing of dies when a variety of gears is heat-treated at the same time. A pusher type furnace is used for carburizing, so it is not possible nor desirable to keep the work in it longer than the prescribed time. At the same time, the gears cannot be allowed to cool below their critical temperature.

In order to solve the problem, an auxiliary electrical furnace has been installed which makes it possible to soak the gears for a short time at the elevated temperature until the proper die for them has been set up in the quenching press. Only in this way is it possible to handle 35 designs without having extensive press equipment.

## A Versatile Chuck

Grinding these ring gears raises still another problem. It is the practice here, as in most automotive plants, to chuck the gears at the pitch line of the teeth when the bores are being ground. If a special chuck were used for each gear, as is usually done, 35 special chucks would have to be used.

In order to avoid this expensive tooling investment, the device used in Fig. 9 is employed. This consists of an adjustable chuck, which allows the setting of the pins which fit between the teeth to be altered to suit each particular design of gear. As can be seen from the illustration, these pins may be adjusted in an arc to suit different numbers of teeth. The pins themselves may be changed to accommodate variations in pitch.

Two such chucks are sufficient to hold the entire range of ring gears manufactured at McKinnon's from those for the smallest passenger car to those for the largest truck. The chucks are set for each design of gear by masters which have been carefully checked for accuracy. The gears are clamped pneumatically, and the bores are ground in Heald Sizematics.

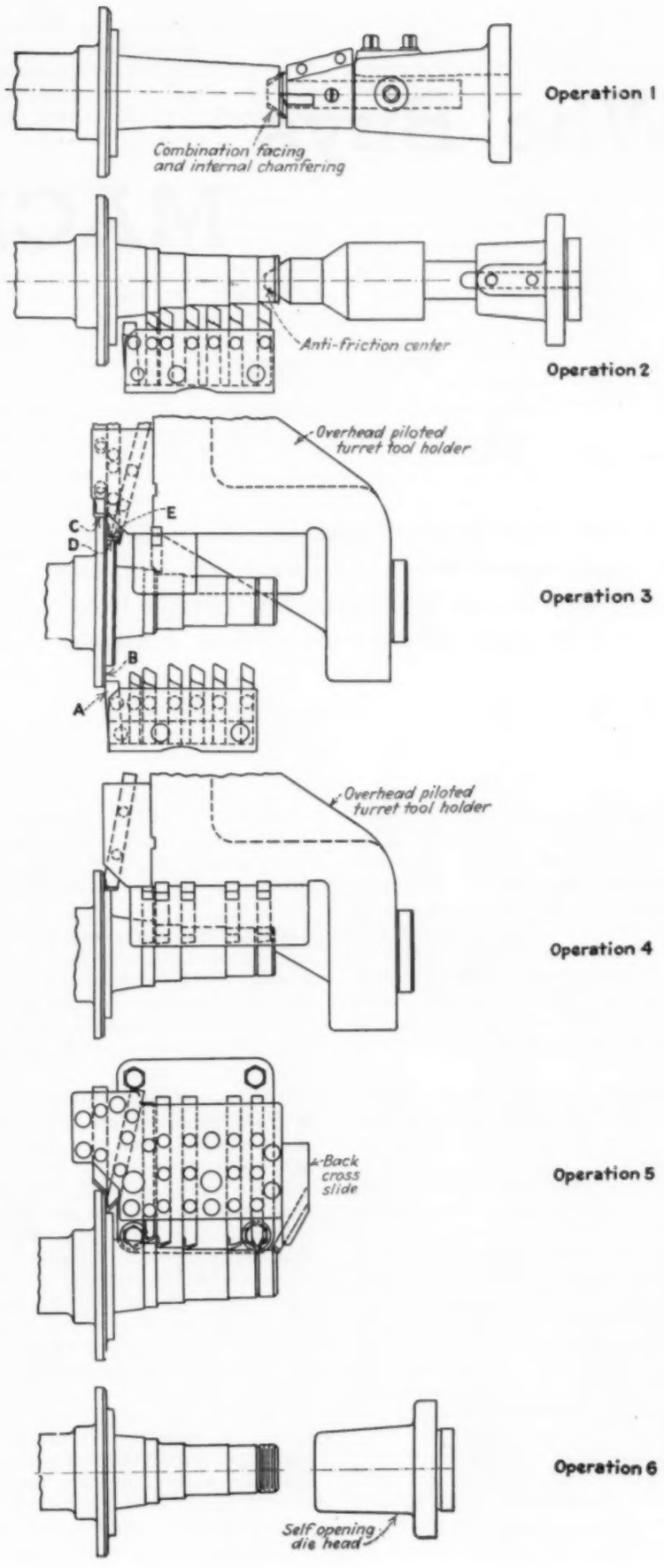



*Fig. 8—The second chucking is an excellent example of the variety of operations which may be performed in one turret lathe set-up*

# Who Buys MACHINERY?

**BERNARD LESTER**

*Westinghouse Electric and Manufacturing Company*

*Author of "Marketing Industrial Equipment"*

**Our talents have been so fully absorbed in the physical accomplishments of the machine itself that we have lost sight of the even more essential factors of its proper selection and efficient distribution**

IN THE RACE to transfer skill from the individual to the machine we have become expert in the design and fabrication of machinery. Mechanical principles have been mastered, existing materials better understood and new materials devised—all making possible the building of complicated machinery to perform complex operations with great accuracy and rapidity, so as to challenge the accomplishments of any age in history.

However, when we consider our wisdom and skill in determining when and where to employ capital in the purchase of such highly developed machinery, there appears to be much yet to be accomplished. Some builders and distributors of machinery have said: "We must learn to merchandise our products." Although the basic business principles employed in commodity merchandising and in the distribution of machinery may be the same, the practice and technique differ widely, and the details of current merchandizing practices are of little value when applied to machinery. Consumption goods are bought because they give satisfaction to the consumer. Capital goods in the form of machinery are bought for only one reason—to create other products or services at a profit. In selling machinery the distributor, to be successful, must think wholly in terms of the interests, problems and processes of the user.

The greatest single opportunity today for the builders of machinery as a class lies in efficient distribution. We are faced with the necessity of developing a sound technique of selling, and this under a new set of conditions existing in industry.

"Obsolescence" and "Modernization" of plant equipment are terms being more frequently used each day. But how about obsolescence in our methods of distribution? In developing plans of distribution have we brought to bear the same degree of intelligence, skill and inventive genius as we have in design and manufacture? True, those who design and build machinery are accustomed to deal with things both static and dynamic, with facts and with results that can be accurately foretold, whereas in distribution we deal largely with a set of changing conditions and an aggregation of personal equations. But for this very reason we have too generally assumed that distribution in an indefinite subject, not securely grounded upon factual information, and that selling is largely a matter involving the personality of the salesman and the final capitulation of the purchaser. Although the forces involved in distribution—the market and the customer—are more complex, and the factors more difficult to analyze, we can logically deduce with fair accuracy the course of events in the field of marketing and the reactions of customer groups if we can only detect, evaluate and comprehend the various forces at work.

It is possible, then, to assemble definite facts as to what characteristics in a particular line of machinery the purchaser desires and may desire in the future, as to what the market is and in all probability will be in regard to location, distribution, volume, buying customs and as to what should be the technique of reaching the market. Briefly, these operations may be termed product analysis, market analysis and marketing analysis. They are, of course, interrelated. New machinery may develop new markets, and vice versa; new products and new and changing markets may influence marketing methods to a marked degree.

## Product Analysis

The machinery product built is subject to change with time due to factors originating with the builder and to those originating in the customer market. The builder obviously endeavors to improve his product, decrease its cost and expedite delivery.

But his customers' requirements, desires and tastes change. These factors are largely beyond his control, yet they are the ones which form so important a part in determining distribution, and are so vital to all who direct distribution.

Not long ago the sales manager of one of the leading machinery builders made this statement to me: "Within the last year I have deliberately and systematically determined from those using my machines exactly wherein

these machines possess features that are inadequate, and just how they can be improved. I have learned before what are the strong points of these machines, but this investigation has been made to develop the weak points. Coupled with this I have systematically sought the direction in which these machinery users are going, in relation to changing requirements of the machine. Based upon such facts we are planning some rather radical changes in design for I now have definite facts to steer our designing engineers. In the past they have been inclined to tell me what to sell."

### Answers Needed

There were four questions for which this sales manager was trying to obtain an answer, based upon an accumulation of reliable facts:

1. What characteristics not now possessed by the apparatus are required or desired by the customer market?
2. What probable new requirements will be necessary owing to changes in customers' operations, products and processes?
3. What new uses for the manufacturer's apparatus exist and await introductory effort?
4. What is competition offering, and how can competitors' accomplishments serve as a guide to improved apparatus and operations?

Recently I saw a builder of special machinery fabricating the frames of his tools from heavy welded steel plate, the elements of which were laid out and put together in the shop with remarkable speed and simplicity. In so doing he supplied his customers with a stronger and lighter machine, in a much shorter time.

Manufacturers of horizontal motor-driven centrifugal pumps are now building the two elements together, and the close-coupled pump receives ready acceptance because it takes up less space, is more easily installed and moved and can be obtained at a lower price than the old form of pumping unit.

We see such changes going on in all types of machinery, changes based upon customers' desires and practices, safety to the operator, more nearly silent operation, the elimination of dirt and obstruction to light, greater ease in installation, increased attractiveness to the eye. These, in addition to greater operating economies of all sorts, a greater degree of automatic operation, and perhaps the ability to handle a greater variety of work are features which the market brings to the machine if the builder will only study more closely his product in view of the market.

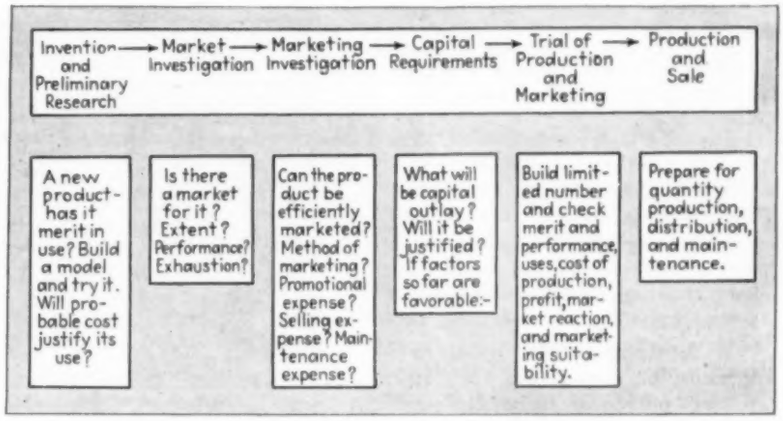
### Market Analysis

Some of us are inclined to shy when we hear the words "Market Analysis." Our minds turn to the statistician, and we look for academic reports illumined by all sorts of charts and curves. As a matter of fact none of us would think of expending capital investment upon a machine or piece of construction without adequate plans and working drawings, yet any number of machinery builders today are expending like capital in distribution plans, facilities and personnel without adequate information on the market.

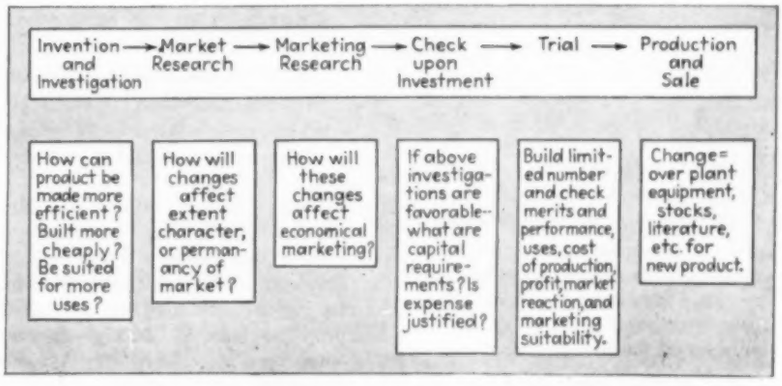
The weakness in one regard in market studies is that they have not been closely enough related to and held a part of sales management and sales policies and procedure.

Just before we entered this great gulf of depression, I received a visit from a young man connected with an advertising concern. His duty was to make a market analysis for a manufacturer of a line of small machinery having a wide sale in industry. He was visiting a number of manufacturers who supplied elements going into the line of machinery sold, and was gathering information upon which to base his report. I could vision this report when completed, neatly typed, nicely bound and elaborately illustrated with attractive curves and charts. The ubiquitous questionnaire was presented, and I noticed that many questions were framed so as to obtain a desired answer.

In conversation with the analyst, I found he knew little of the product and had had no experience with its distribution, and I wondered what the manufacturer purchasing this survey would get out of it, and what important decision would be based upon its findings. Do not infer from this that market investigators and counsellors


Invention and Preliminary Research
Market Investigation
Marketing Investigation
Capital Requirements
Trial of Production and Marketing
Production and Sale
A new product—has it merit in use? Build a model and try it. Will probable cost justify its use?
Is there a market for it? Extent? Performance? Exhaustion?
Can the product be efficiently marketed? Method of marketing? Promotional expense? Selling expense? Maintenance expense?
What will be capital outlay? Will it be justified? If factors so far are favorable:-
Build limited number and check merit and performance, uses, cost of production, profit, market reaction, and marketing suitability.
Prepare for quantity production, distribution, and maintenance.

***When a new product is to be placed on the market a logical sequence of thought and action is needed to develop it effectively***


Invention and Investigation
Market Research
Marketing Research
Check upon Investment
Trial
Production and Sale
How can product be made more efficient? Built more cheaply? Be suited for more uses?
How will changes affect extent character, or permanancy of market?
How will these changes affect economical marketing?
If above investigations are favorable—what are capital requirements? Is expense justified?
Build limited number and check merits and performance, uses, cost of production, profit, market reaction, and marketing suitability.
Change-over plant equipment, stocks, literature, etc. for new product.

***The steps to be followed in improving an existing product, while similar, differ in several important details***

do not do a most valuable work, for when capable, experienced and thoroughly honest, their help is most valuable. What does appear of the greatest importance is that market analysis must be an intimate part of sales management, and not an entirely detached and assigned activity.

The principal purpose of market analysis is to ascertain the location, extent, volume and character of the market for a product line in order that:

The product can be created, or altered, to meet the market requirements;

There may be determined volume and price requirements;

Effective methods may be adopted of distributing this product to the market, so that

A fair share of profitable business for the product can be obtained by the manufacturer.

Any market study must be approached (a) with relation to the location, size and buying power of the purchasing units, and (b) with relation to business conditions and industry characteristics.

In relation to *location, size,* and *buying power* there should be made:

1. A study of the number of buying units, and a territorial or industry evaluation of the purchasing power of each group;

2. A study of the location, size and average purchasing power of each buying unit or territorial group;

3. A study of the index or measure of consumption of the product offered by the equipment builder, as purchased from all sources;

4. A study of transportation costs and the effect of the manufacturer's location on his market.

In relation to *business conditions* and *industry characteristics:*

1. A determination of the applications of the product in each industry, with particular reference to new uses both in established industries and in new industries;

2. A classification of customers, according to industry or business —with industry statistics upon consumption of product offered by equipment builders;

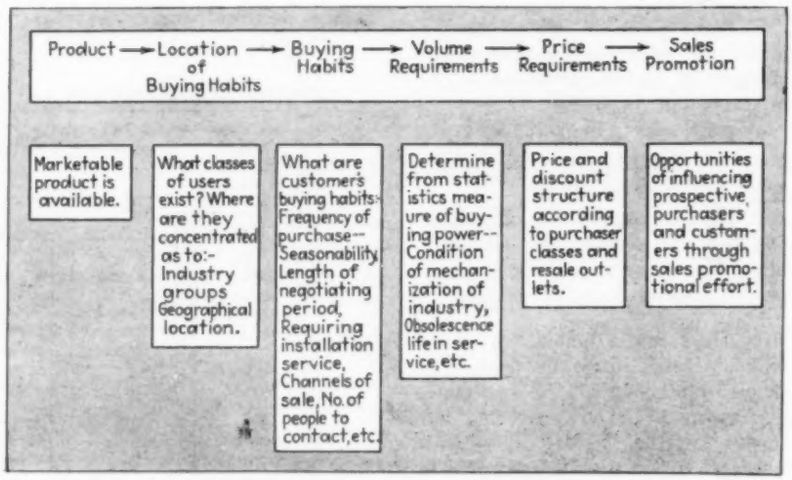
3. Determination of special influences on the market and sales possibilities due to variations in business conditions or changes on the part of related industries which in themselves are not a factor in product consumption;

4. A study in each industry of new methods or processes that are likely to affect the demand for the equipment offered;

5. Consideration of the life in service and obsolescence rate of the equipment in each industry, together with opportunities for plant and equipment modernization;

6. How price changes or altering market conditions for the products of prospective purchasers in each industry will affect the demand for the equipment product offered;

7. What changes are taking place in the financial conditions of prospective purchasers that may alter their ability to purchase;


Product → Location of Buying Habits → Buying Habits → Volume Requirements → Price Requirements → Sales Promotion
Marketable product is available.
What classes of users exist? Where are they concentrated as to:- Industry groups Geographical location.
What are customer's buying habits: Frequency of purchase-- Seasonability, Length of negotiating period, Requiring installation service, Channels of sale, No. of people to contact, etc.
Determine from statistics measure of buying power-- Condition of mechanization of industry, Obsolescence life in service, etc.
Price and discount structure according to purchaser classes and resale outlets.
Opportunities of influencing prospective purchasers and customers through sales promotional effort.

***No less vital than the design of the product itself are the stages needed in making a market analysis for its sale***

8. Probable effect of foreign competition on the buying power of prospective purchasers;

9. A study of the possible effect of legislation, such as tariff laws, which may influence the prospective purchaser's buying power.

What talents the manufacturer should employ in making market studies has always been a debated question. The work may be assigned to regular salesmen as an additional duty to that of selling, experienced employees may be wholly assigned to the work, or independent institutions may be employed for the special purpose. All have their advantages and disadvantages, and much depends upon the product, its acceptance and the experience and position of the manufacturer.

Many salesmen are inclined to treat the work as perfunctory and as interfering with selling. Where specially assigned employees are used for this particular duty the results are usually disappointing unless such men are mature and have had selling experience, because they have difficulty in making proper contacts and evaluating factual information. The use of independent investigators, if thoroughly experienced, honest and reliable, is often valuable in introducing new ideas and bringing to the surface new customer demands, which may be overlooked where a manufacturer's own organization has fallen into a rut.

With the most successful companies market analysis is a continuous process in which sales management takes a vital interest. In the rapidly changing markets which face us today, it is not only a light to guide the way, but is also a mirror reflecting customer opinion which enables us to make ourselves commercially presentable.

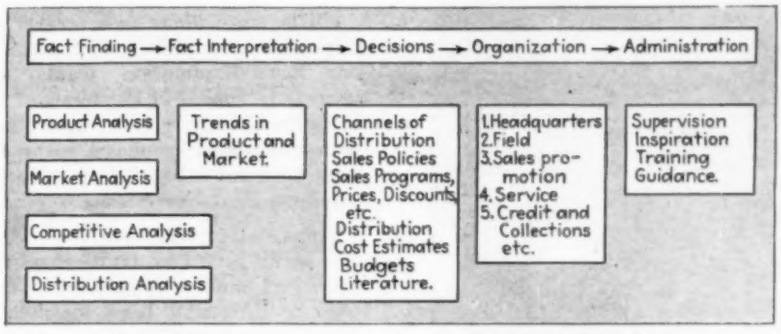
## Marketing Analysis

A study of distribution or marketing methods is quite distinct from a commercial study of the product, or of the market itself. It is a study of methods—how to do things successfully. It might me compared with the actual operation of a railroad system, where the freight handled represents the product manufactured and sold, and the various destinations the cus-

tomers or market. A study of distribution methods and procedure is vital, not only to sales volume but particularly to sales efficiency. Any study of distribution or marketing must include a study of prospective purchasers' and customers' reactions and relationships, as well as a study of the performance of the particular machinery builder's organization in selling.

Not long ago a machinery salesman I knew visited a plant in response to an inquiry received for a quotation upon a particular machine. He had found out what the manufacturing superintendent of this plant wanted and had submitted a quotation giving the prospective purchaser all the information asked. He thought he had done a good job and anticipated receiving an order for the machine, because he felt he had convinced the prospect that the machine he was selling had merit.

This salesman had done a good job of "response selling," for he had responded to an advance on the part of the prospective purchaser.


Fact Finding → Fact Interpretation → Decisions → Organization → Administration
Product Analysis
Market Analysis
Competitive Analysis
Distribution Analysis
Trends in Product and Market.
Channels of Distribution Sales Policies Sales Programs, Prices, Discounts, etc. Distribution Cost Estimates Budgets Literature.
1. Headquarters 2. Field 3. Sales promotion 4. Service 5. Credit and Collections etc.
Supervision Inspiration Training Guidance.

***In much the same manner a careful plan of action should be followed in developing a distributing plan and organization***

A little later I met a salesman who was selling power-house equipment. He had been studying the industrial establishments in this territory, among which were a number of paper mills. He had found that most of the power systems in the mills were antiquated and inefficient, and anticipated that modernization would justify capital expenditure in new equipment through resulting cost reduction in the finished product. After an interview with the executives of one of the more prominent mills, and with the support of the mill superintendent, he received permission to make a power survey of the mill. With the aid of one of the engineers of his own company, and the availability of the mill superintendent's records, this survey was completed and embodied in a brief and logical report which could be understood by any business executive. This report had as its conclusion a definite saving in dollars to the mill owner, for a definite capital investment, which in this instance justified the expenditure without doubt.

Instead of presenting the report to the mill owner alone he took with him the mill superintendent, giving him full credit for his contribution to the study made and the conclusions reached.

This salesman was successful in obtaining a valuable order for machinery. This was a clear cut case of "creative selling." He had projected himself into the business of his prospective customer, had shown him how he could save money in operation, and in so doing had strengthened the hand of the mill superintendent and performed a real service to the paper mill owner.

The various steps of procedure in selling may thus be summarized:

1. Initiating the need, so that it is recognized by the prospective purchaser;

2. Justifying the outlay of money in the prospective purchaser's mind;

3. Securing consideration and an approval to the expenditure;

4. Accomplishing the specification of the manufacturer's machinery and equipment;

5. Obtaining the order.

We are passing from the period of "product selling," when the salesman stressed details of the product sold, to "application selling." What interests the customer is *what the use of the apparatus* will do in helping him *make a larger over-all profit* in his operations. The principle is a simple one, yet how few salesmen are alive to its full significance and employ it from day to day.

Obviously the salesman must know the technical characteristics of the machinery sold, but too often he becomes so engrossed in its features and advantages that he misses the fundamental upon which selling machinery rests—profit to the user.

There is no question that this form of creative selling takes time and patience, but in the end it will go far toward increased efficiency in selling, because permanent relationships with customers are built up, plant superintendents themselves see the advantage of doing much of the detailed investigation work, and the capable salesman becomes more of a business advisor to his customer. Many of the more progressive industrial plants have done such work themselves, and many machinery builders have lagged behind in this thinking, and have focused their attention too much upon apparatus details in selling.

The *American Machinist* 1935 Equipment Inventory indicates how the tax of obsolescence on industry has advanced and how the latent demand for machinery has accumulated. Will machinery builders meet this demand with a more intelligent and efficient method of selling?

The answer to the need for attaining greater efficiency in the distribution of engineering products will largely come through a better training of men in the principles of distribution, both by our educators and by our commercial executives. It will be the kind of training which will possess little of the high pressure methods used in commodity distribution but, though no less aggressive, will be built upon a knowledge of business principles, an understanding of the technique of machinery and its application, and an intimate appreciation of the industrial market.

## About German Machine Tools

Here are a few interesting German developments in machine tool lines: horizontal boring machine with 7⅛ in. hollow spindle, so coolant can be pumped direct to the cutting tool; crankshaft lathe with swing of 10 ft. 6 in. x 60 ft. between centers; disk grinder with grinding wheel made up of small round abrasive wheels fastened to the disk and grinding in the sides of these small wheels; automatic shaper for herringbone gears; planer-type vertical spindle grinder with a 4½ ft. segmented abrasive wheel that can grind work 13 ft. long.

# WANDERER Makes MILLING MACHINES

K. H. CONDIT
*Editor, American Machinist*

**Sharing in the government-stimulated activity of machine tool builders, Wanderer's Siegmar Works operates on three shifts of 48 hours each**

*Raw materials enter the plant at one end and finished machines leave at the other*

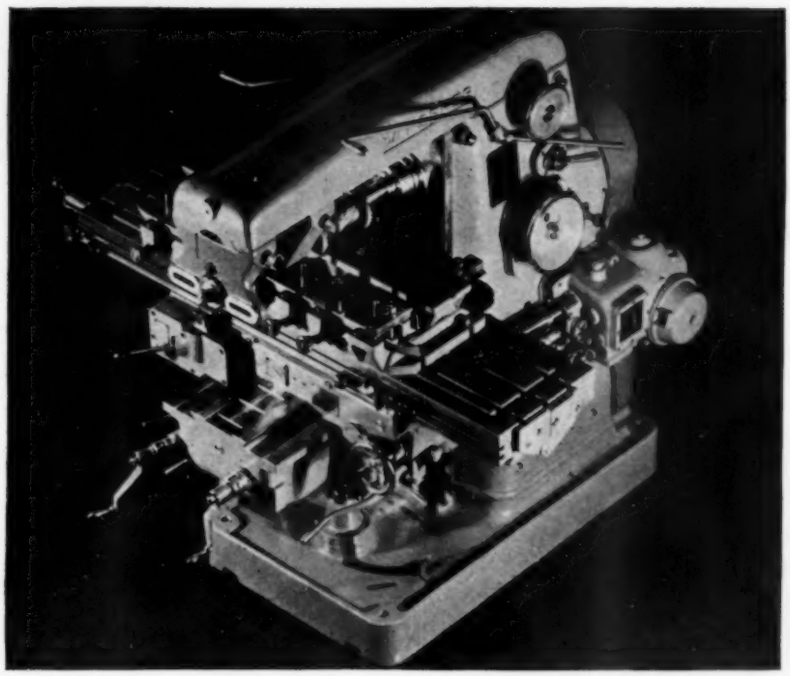
MACHINE TOOL plants in Germany are busy. Until a few weeks ago they were straining every effort to fill the orders resulting from the government edict of 1934 relieving replacement machine tools and other production equipment from taxation, provided the displaced machines were scrapped. So effective was this provision in stimulating business that it was rescinded at the end of 1934 although the machine tool plants were allowed six months beyond that date to fill orders taken as a result of it.

Furthermore, there is a serious accumulation of obsolete equipment in the Reich's munition plants and arsenals by reason of the terms of the Versailles Treaty. Now that those terms have been denounced, many machine tools must be built to bring the munition plants up to date.

Coupled together, these two sources of demand have kept the German machine tool builders going on a 48-hour two- or three-shift basis for months. From now on the second source will dominate and the first one will probably be succeeded by export demand generated by the export subsidy fund now being collected.

Typical of this feverish activity in production is the situation at the Wanderer Works at Siegmar, just outside Chemnitz. Here 2,600 men are working 48 hours in three shifts, building milling machines of various types. A trip through this plant would be interesting to any American connected with the machinery industry.

The plant itself is of saw-tooth roof construction, with raw material entering at one end and proceeding along progressive manufacturing lines to final assembly. Precision grinding and testing of leadscrews is done in a constant



*A straddle-milling cut is taken on a typical machine produced by this plant*

plant, at Schönau, employs over 4,000 men and in it are built bicycles, motorcycles and business machines. The automobile subsidiary which built the Wanderer car for over 20 years has been disposed of to Auto-Union.

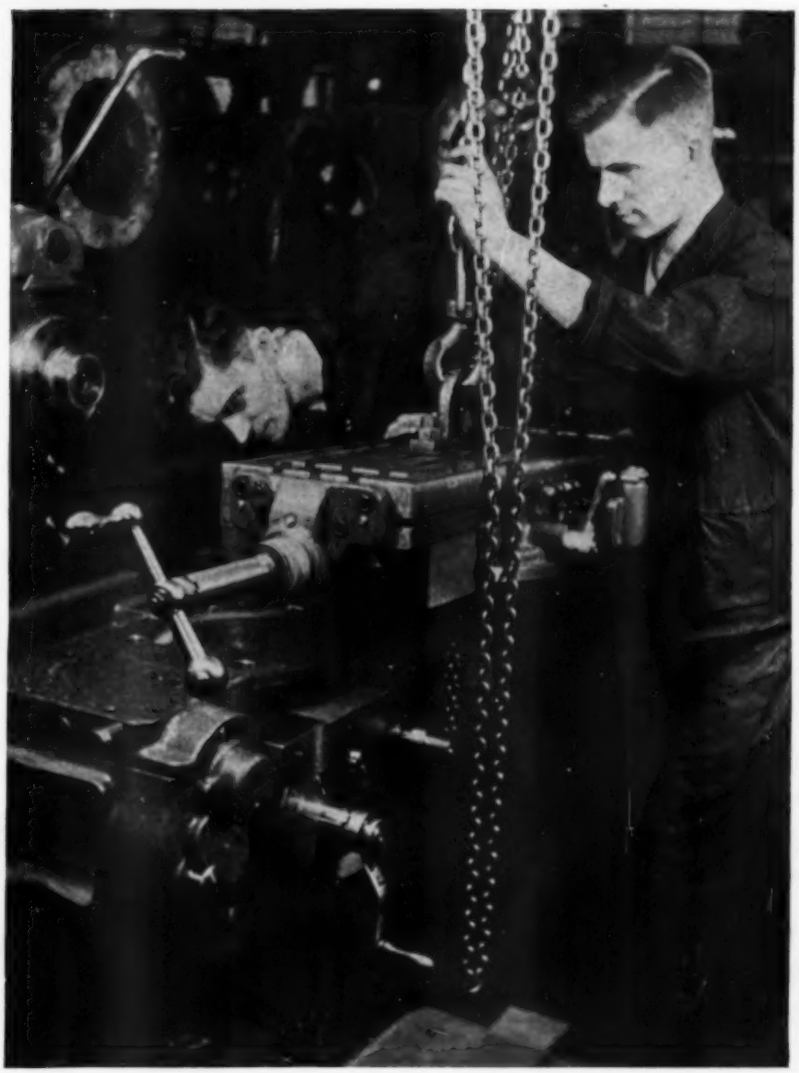
The Wanderer Company is celebrating its fiftieth anniversary this year. It started as a small bicycle shop and gradually added the other lines. Its first machine tools were put on the market just prior to 1900 although it had been building them for its own use before that time. Some idea of the type of tool being built today can be gained from the illustrations of this article which are printed by courtesy of the Wanderer Works.

temperature department on modern equipment, and to limits of accuracy well within those set by Dr. Schlesinger, formerly of the Charlottenburg Technical High School, as adequate for this type of work.

As is customary in German plants today the head of the company is the party leader of the Nazi unit which is the plant. He deals with the men through a works council elected by the men but nominated by himself. The men can vote down a nominee but they cannot offer nominations of their own.

A foreigner is naturally struck by the frequent exchange of Nazi salutes as he walks through the plant. The interesting thing about it is the friendly informality of the saluting, indicating an atmosphere entirely different from the veiled hostility of the old days when unions controlled the labor situation. The men may have lost a large measure of independence, but they have in its stead a fanatic devotion to a cause which is most impressive. The existing type of organization would be effective in war time; it is quite as efficient in time of peace.

This Siegmar plant of the Wanderer Works is the smaller of the two operated by the company. The larger



*Devotion to the Nazi cause has supplanted the old hostility of trade unionism*

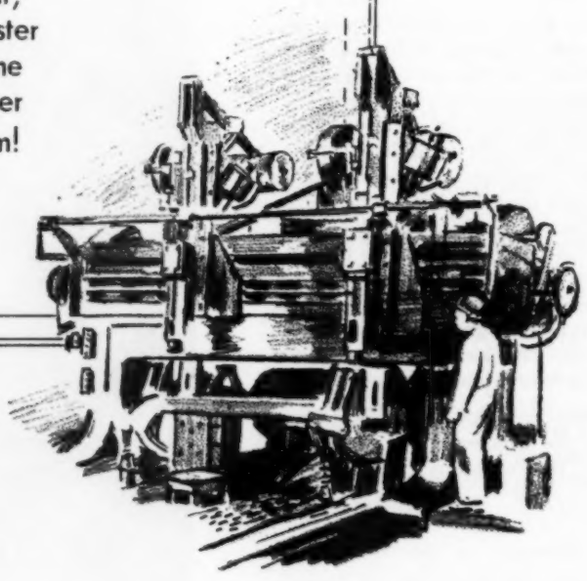
# MAGIC MAKERS

**By Berton Braley**

These are the Tools of Wonder
  That build, according to plan,
Mechanical magic, under
  The vigilant eye of Man.
Theirs is a strength created
  For the work of a titan age
—Precisely calibrated
  On a microscopical gage.

Out of the steel they hammer
  And plane and bevel and drill
Today's most genuine glamor,
  Tomorrow's mightiest thrill;
These are the true World-Shakers
  With giant metallic thews,
These tools that machine tool makers
  Have wrought for the world to use.

Without their power, invention
  Is only a Thought—a mere
Vague philosophic contention
  That never would turn a gear;
For these are the tools that master
  The practical, working scheme
And shape real miracles, vaster
  Than any of which we dream!



**THE MACHINE TOOL SHOW, sponsored by the National Machine Tool Builders' Association, will open its doors at Cleveland on September 11. To the advances in metal-working to be displayed there, this poem is dedicated**

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EDITORIALS

VOLUME 79 AMERICAN MACHINIST ESTABLISHED 1877 NUMBER 16
McGRAW-HILL PUBLISHING COMPANY, INC.

K. H. CONDIT • F. H. COLVIN
EDITORS

# TIME TO ADJOURN

DIVIDED as sentiment in this country is on many matters it is united that Congress has been in session too long and should adjourn. Reasons for this feeling vary according to the occupation of the citizen and with the region in which he lives.

A few of us are moved by humanitarian motives. We have only to look at a press photograph of a Congressional hearing to see that the members are worn out. After all, a summer in Washington is no joke, as many a business man who fought the NRA fight two summers back will testify. Senator Copeland, a physician, says that much more of this sort of strain may lead to permanent injury or even death for some of the weaker members.

It should be perfectly obvious to any sane person that such revolutionary legislation as the Utilities Bill, the new tax measure, the Social Security Bill and the AAA amendments cannot be handled properly by a Congress that is in the shape this one is in. If the aim of the administration is to force through a few more laws that will be declared unconstitutional by the Supreme Court, as seems more than likely to be the case, then perhaps its chances are better than as if the men who will vote on them were not too worn out to know or care what motive is behind the bills.

But even if it gains its immediate ends the administration is taking a long chance that bonus bills, thirty-hour bills and directly inflationary bills of several types will not be introduced separately or tacked onto existing bills as riders. The movement for that sort of legislation is beginning to get under way already.

No wonder every business man you see says that he would have less to worry about if Congress would only go home before it can throw any more monkey wrenches into the recovery machinery. If you can get him off this subject you are more than likely to discover that business is really very much better with him. And you will find that he is gradually coming to two fixed opinions: (1) that the administration has managed for political reasons to hinder every recovery movement that has started; (2) that despite its obstructive actions the basic recovery is too strong to be stopped. He is keen for immediate adjournment.

Congress will not at this stage do anything that will be particularly helpful. Its members are in a frame of mind to accept almost any New Deal proposal, sound or unsound, if only they can get away from Washington. Their continued presence is the main thing that is darkening a brighter industrial and business picture. It is time to adjourn.

# Another Revolution

IF ONLY half of the startling new developments planned for the Machine Tool Show come through another revolution in machine-shop practice is upon us. Every prospective exhibitor has something sensational up his sleeve. With most of them the question now is whether they can eliminate the last remaining bug before the Show starts. And that is only six weeks hence.

Since this is the first exhibit in six years it is reasonable to expect that innovations will be many. Not that many improvements have not been made during this period. They have, and the customer has duly profited thereby.

But such a show as this one is the place for a major effort and the cumulative effect of all these major efforts by all of the more than two hundred exhibitors is going to be one no user of machine tools can afford to miss. Apparently this word has spread beyond the borders of this country for many foreigners are planning to visit Cleveland in September. From Germany alone a party of fifty machine-tool builders is coming under the guidance of the managing director of the machine-tool association of that country. They may not come to buy but they will certainly be on hand to look.

This newest and most imminent revolution will be a bloodless one, but it may well have far-reaching consequences.

# Chips

*Washington*—U. S. Circuit Court of Appeals in Boston rules AAA unconstitutional while corresponding court in New Orleans reverses Judge Grubb and holds TVA constitutional . . . Senate votes amendment to AAA permitting processors to sue for return of process taxes paid . . . House revolt on tax bill is summarily squelched by Roosevelt . . . Investigation of utility lobby stirs up some mud in Pennsylvania . . . Next year's relief bill now set at $3,000,000,000 . . . Hopkins confidently predicts he will have 3,500,000 at work November 1 and will then turn 1,500,000 unemployables back to the states; has 15,000 at work so far . . . HOLC gets hard-boiled and starts foreclosure proceedings against obstinate delinquents . . . CCC will double school facilities to take care of 500,000 . . . Suggestion by Representative Fish that President might be impeached draws angry Democratic defense of his actions . . . Roosevelt "desires" Congress enact legislation affirming neutrality . . . Utility Bill conferees eject New Deal experts who invade executive session . . . Democrats of Ways and Means Committee present tax bill draft with corporation surtaxes at 13¼ and 14¼ per cent.

*Foreign*—Mussolini and Haile Selassie plan to lead troops in the field as Ethiopian war gets nearer . . . George V reviews British fleet as Japanese fleet starts naval exercises in Pacific . . . Laval decrees promising savings of over $700,000,000 cause riots of bureaucrats whose salaries are cut and police arrest 1,000 . . . Vatican protests Nazi sterilization regulations as applied to Catholics . . . Nazis replace moderate Berlin police chief by ardent anti-Semite and strengthen measures against Jews, Catholics, Protestants and the old Stahlhelm . . . His first act is to confiscate editions of 22 foreign language newspapers for obvious reasons . . . Protestants and Catholics mob each other in Ireland . . . End of navy quota system comes as Great Britain drops it . . . Cost of mobilization forces Italy to reduce gold coverage of lira below 40 per cent . . . Japanese army shake-up recalls extremists from China and Manchukuo . . . Nazi leaders condemn foreign newspaper correspondents for "atrocity" stories.

*Finance*—Suits against federal government under gold clause legislation are barred by House vote . . . Westinghouse swings from loss to substantial profit in first half, other industrials report encouraging gains . . . New fears felt for gold bloc as Dutch and Italian exchanges drop abruptly.

*Industry*—House Labor Committee gets behind a new 30-hour bill which would require federal licenses for all business except banks, publishers and agriculture . . . House rejects Clark amendment to Social Security Bill which would protect private pension plans and measure remains in conference . . . President of New York Shipbuilding at Camden declines Secretary Perkins' strike arbitration plan on ground it would wreck his company . . . Plant is reopened and violence ensues . . . General strike in Terre Haute ends after declaration of martial law and mobilization of 2,000 National Guardsmen . . . June factory jobs and payrolls lower than in May.

*Trade*—W. C. Forbes, leader of recently returned business mission to Japan, expresses hope that Japanese will cease dumping low cost goods in U. S. . . . Japan puts surtax of 50 per cent on Canadian goods . . . Canada retaliates with 33⅓ per cent on Japanese goods.

*Indicators*—Steel production increases again and returns to May level . . . Electric power output climbs to within a fraction of 1929 record high . . . Business Week's index rises strongly to 64.4.

# Congress Swelters But Stays With Reform Program

WASHINGTON—Hot weather and natural inclination are not sufficient to start the exodus of perspiring congressmen from Washington. Weary as they are of the shores of the Potomac, the Administration's strength and patronage is still sufficient to keep them plugging away half-heartedly at the President's program. The political advantages of getting most of the bad news over at this session are obvious; then the Administration can assume a more benevolent and less coercive rôle to foster further business gains before November, 1936.

Press dispatches, voicing the expectation of another relief appropriation of three to four billions, were designated by the President as "completely cuckoo." These rose from his conference with Morgenthau, Hopkins and Miss Perkins, which he later described as containing no news. However, the admission that a method of determining the extent of unemployment, as of December 15, to prepare a budget message for Congress confirmed the belief that the current relief program is not regarded as the last.

Congress hated to take up tax legislation—would have liked to put it off but cannot make an issue out of it when the budget is out of balance and social objectives are involved. The President is in a position to secure action but indications are that Congress will do its own thinking. Revenue legislation is the subject with which Congress deals most effectively. Witnesses before the Ways and Means Committee made a good case in their endeavor to establish that the present act will raise tremendous sums if only confidence can be restored and business encouraged to get into its normal stride.

### Tentative Tax Rates

Tentative provisions of the tax plan, drafted by Democratic members of the Ways & Means Committee, include a compromise between the graduated corporation tax and the excess profits tax. The impost now suggested ranges from 13¼ to 14¼ per cent instead of the present flat 13¾ per cent and the 10 to 17½ per cent formerly proposed. Excess profits over 8 to 12 per cent are assessed at rates from 5 to 20 per cent.

Surtaxes on industrial incomes are graduated up to 75 per cent, estate taxes run as high as 75 per cent on that portion exceeding $10,000,000 and gift taxes amount to about three quarters the estate taxes in the latest draft. Provisions, in general, tend to moderation of the proposals attributed to the Administration.

In the matter of wages and hours, the unfavorable records of small corporations stand out in such contrast with those of large corporations that even Administration stalwarts are wondering if bigness is so bad after all.

Any bill that may eventually be reported will be purely a party measure, but the whip will have to be applied vigorously if Democratic members are to be held in line. While any Administration measure can be forced through the House, there is certain to be a field day when it reaches the Senate.

Conferees of the two houses on the social security bill gave Secretary Perkins another slap when they agreed to make the Social Security Board an independent organization. Previously Miss Perkins had been denied administrative supervision over the National Labor Board. The conferees went so far as to place child welfare expenditure under the Board rather than under the children's bureau of the Department of Labor. The bill was liberalized in giving greater seasonal exemptions and by exempting employers of fewer than eight persons.

### Glass Banking Bill

Senator Glass skillfully guided a well-written banking bill through the Senate. As contrasted with the House measure the bill creates a more independent Reserve Board; gives the member banks representation in the agency for open-market operations and thus limits the likelihood of inflation or deflation at party demands; and allows only a narrow range for variation of the ratio of reserves to deposits.

Henry I. Harriman, former president of the U. S. Chamber of Commerce, is chairman of a new committee that will assist the NRA division of Review to gather and compile information of what took place in codified industries during the past two years together with precode and past code data. Other members are Robert M. Field, New York lawyer and writer; James W. Hook, president of Geometric Tool Co., Morris E. Leeds, president of Leeds and Northrup; George H. Mead, president of the Mead Corporation and Walter White, formerly resident director and member of the Industrial Advisory Board of NRA.

## John Bath Dies

John Bath, manufacturer and inventor, whose death on July 9 was recently announced (*AM*—Vol. 79, page 528), was born in Frostburg, Md. He began his career at the age of twelve, as a miner, but within a short time changed his employment to that of apprentice at the car shops at Huntington, Pa., and Readville, Mass.

Later Mr. Bath obtained employment with the Becker Brainard Milling Machine Co., Hyde Park, Mass., where he worked for several years, receiving an opportunity to learn thoroughly the machinist trade. While at Hyde Park he invented the Bath indicator, the first instrument of its kind to measure in thousandths of an inch.

He next became connected with the Norton Co., Worcester, Mass. On leaving this concern, he developed a universal cutter grinder for the Waltham Watch Tool Co.

Following this he founded the Bath Grinder Co. in Fitchburg, Mass., where he developed the Bath universal and plain grinders. Leaving this company to other hands he founded John Bath & Co., Inc., Worcester, Mass., of which he was president and treasurer at the time of his death.

Almost simultaneously with the founding of this business, the World War broke out, and until its conclusion, the company was engaged in supplying jigs, fixtures and gages for gun and munition purposes. After the war Mr. Bath concluded that his efforts could best be expended in developing more accurate taps. His experiments resulted in the production of taps made

of high-speed steel, with the entire thread ground from the solid after hardening.

The automotive industry was quick to recognize the savings this tap afforded, since it solved its problem of duplicating size. The demand spread to other industries, and today the high-speed ground thread tap is standard where production and accuracy are necessary.

Mr. Bath was also the inventor of the Bath internal micrometer—an instrument for measuring internal diameters up to 0.001 in. He was widely recognized as a pioneer in precision thread production, and his passing was mourned by friends everywhere.

## K. T. Keller Becomes Chrysler President

According to an announcement made by Walter P. Chrysler on July 23, K. T. Keller, vice-president and general manager who has had charge of the production of all Chrysler Motors units, will become president of the corporation. Mr. Chrysler, who has held the offices of chairman of the board and president, will continue as chairman of the board and chief executive.

B. E. Hutchinson, vice-president and treasurer, who has had charge of the corporation's financial affairs since 1921, will become chairman of the finance committee.

Fred M. Zeder, vice-president in charge of engineering, who under Mr. Chrysler's direction designed the first Chrysler car and all its successors in the Plymouth, Dodge, DeSoto and Chrysler passenger line and Dodge trucks, will become vice-chairman of the board.

H. A. Davies, who as assistant treasurer has been in direct charge of the corporation's treasury operations, will become treasurer.

After an apprenticeship with Westinghouse, Mr. Keller became assistant to the superintendent of the automobile engine department of that company in 1909. He went to Detroit in February, 1910, and has been intimately associated with the automotive industry since that time. He joined the Chrysler Corporation in 1926, and in 1928 with his associate executives undertook the enormous task of combining Dodge Brothers plants, operations and organization with those of Chrysler. He became president of Dodge in 1929.

*Chrysler President*

K. T. KELLER

*Engineering Vice-President*

FRED M. ZEDER

### Corporation Reports

| Company | 1935 Earnings First Half | 1934 Earnings First Half |
|---|---|---|
| American Brake Shoe & Fdry. Co. | $773,688 | $658,231 |
| Caterpillar Tractor Co. | $2,908,152 | $1,882,240 |
| Cincinnati Ball Crank Co. | *d*$20,337 | *d*$14,294 |
| Cutler-Hammer, Inc. | $221,438 | $105,489 |
| Doehler Die Casting Co. | $360,706 | |
| Fyr-Fyter Co. | $17,754 | *d*$1,295 |
| Houdaille-Hershey Corp. | $1,773,626 | $725,808 |
| Marion Steam Shovel Co. | *d*$190,815 | *d*$262,284 |
| Seagrave Corp. | *d*$3,020 | *d*$26,422 |
| Stewart-Warner Corp. | $1,020,491 | $540,260 |
| Westinghouse Electric & Mfg. Co. | $6,265,188 | *d*$31,725 |

*d*—Deficit.

## Plant at Indianapolis to Build G.M. Engines

A contract has just been awarded to the Austin Co., of Cleveland, to construct a new plant at Indianapolis, Ind., for the Allison Engineering Co., division of the General Motors Corporation, which will develop and produce liquid-cooled aircraft engines. The plant, which will occupy a 13½ acre site, provides initially for 41,000 sq.ft. of floor space.

The aircraft engines to be constructed at this plant will be of 1,000 hp., the most powerful aviation units made in this country. Four buildings are included in the project; the manufacturing unit will house the machine shop, electric furnace room, paint shop and shop office.

## Farm Tool Exports Increase in May

With a gain of 47 per cent over the same month of last year and 25 per cent over April, exports of farm equipment during May totaled $2,781,845, according to the Commerce Department's Machinery Division. Outstanding was the increase in foreign shipments of wheel tractors; sales abroad totaled 1,024 units, valued at $831,171, compared to 392 units valued at $322,153 for May 1934. Trade in 15- to 32-belt hp. type and 33-belt hp. and over type was exceptionally good.

Exports of track-type tractors increased 45 per cent, the May trade amounting to 276 tractors, valued at $533,887 as against 203 units valued at $367,311 for May of last year.

## Foundry Equipment Sales 42 Per Cent Above 1934

With an index of net orders of 100.1 as compiled by the Foundry Equipment Manufacturers Association, June very nearly maintained the level of 100.7 reached in May and was well over the 70.4 figure of June a year ago. Shipments were higher for the month with an index of 82.2, as compared to 67.0 for the preceding month and 64.3 for 1934.

Unfilled orders also gave a good showing, moving from 117.7 in May to 135.6 in June, both of which were greatly above the index of 57.8 for June, 1934. These figures are based on the reports of 22 companies.

# Prospects Bright For Continued Equipment Purchases in Detroit

DETROIT—With July production schedules trimmed closely to sales, interest and activity centers on preparations for the November 2 showing. Several parts suppliers will have completed runs for 1935 models by August 15; one will complete releases by the end of July and will be down for at least half of August, preparing for the new models. Some new jobs are tooled up and contracts signed; banks of some new parts were started July 22. Chevrolet's August production schedule is high, but the Toledo strike retarded normal output and continued high production is to be expected.

Registration of new passenger cars in May totalled 293,200 and June is estimated at 270,000; random samples indicate business was sustained in July. Experience this year is unlike that of past years, in that formerly preparations were made during the low sales months at the end of the year. Because of the agreement early in the year while the industry was still operating under the code, model introduction was advanced to 60 days either side of October 1. The subsequent setting by A.M.A. of the New York show date at November 2 brings the change-over period at a time when sales of present model cars continue at a high level; past experience was that July and August yield sales near the peak of the year.

### Truck Sales Improve

Truck sales in June are running ahead of May, contrary to the experience in the passenger car field. Many suppliers of parts for both truck and passenger cars find that dollar volume has remained about the same for June and July as a result of continued strength in truck sales.

From continued optimistic reports of inquiries and closings in the machine tool industry, belief that the jam in the heavy industries has been broken finds considerable justification. Within the past two weeks used machinery is being pushed out by two of the larger producers. These machines are individual motor driven and comparatively modern. Shortages are reported in certain classes of used machinery, especially in radial drills and horizontal boring mills.

Statements that more machine tool business has been written the first six months of this year than in all of 1934 increase in number, and inquiries are at present on a level which leads to the belief that the second half of the year will be better than the first. Standard machines, while ahead of 1934 experience still account for a small part of the total. Spending by General Motors for its various units would make an impressive total were the figures released. While most of the new models will be out in time for the New York show, some large changes will not be made until later with considerable machine and die business in prospect.

Helpful also to machine tool builders is the decision July 22 of Chrysler directors to spend $7,000,000 "for rounding out facilities" of the plants. Little has been spent during and since the depression for this purpose. The hopeful thing about the machine tool buying at present is its broad nature; while recent Chevrolet purchases have accounted for a large part, buying in smaller amounts among suppliers is general. Deliveries run from three to twelve weeks.

Expansion in glass making has helped certain lines of machinery manufacturing. The Ford development, resulting from threatened shortages earlier, an increase in price and refusal of established companies to make anything but laminated glass, is progressing to the point where production is being turned out, but on an experimental basis. Developments in Canada and expansions, other than Ford, in this country have helped. The Pittsburgh Plate Glass—Chrysler and General Motors—Libby, Owens, Ford hook-up left little choice to the Ford Company except that of making its own glass.

While little action is apparent on the surface, plenty is taking place behind the scenes in the direction of moderation in labor relations. President Green has publicly cautioned locals in the way to conduct themselves under the Wagner bill. A sincere attempt is being made to maintain hour and wage

# Industrial Review

**• Although there are some exceptions to the general opinion distributors of machine tools in twelve industrial centers attribute the moderate decline in orders during the last half of July to the imminence of the Machine Tool Show. Even so almost every one professes to be surprised at the volume of July business and satisfied that it is as good as it is. A few even believe that August business will be pretty good. Those manufacturers who participated in the recent Russian orders are feeling cheerful.**

**• In New England July orders were not up to the June level but the extent and "liveness" of the inquiries is a hopeful sign for August. New York and the territory surrounding it has been quiet during the month. Most of the real activity has centered around the Amtorg office. Philadelphia reports a good first half and a slow second half for July. Buyers are waiting to see what is to be seen at the Show. July in Pittsburgh, on the contrary, was the best month of the year for at least one distributor, and orders were divided between special and standard machines.**

**• Cleveland, also, has had a good July. Dealers there find it hard to guess what August will produce because the favorable factors are likely to be balanced by unfavorable ones. Volume in Detroit is down somewhat, particularly in the supply end, but the outlook is excellent. The tool shops are already well occupied and the automobile shops will have to swing into production on new models shortly. July, on the whole, was a satisfactory month in Toledo. Orders and inquiries fell off during the last half but there are still plenty of inquiries outstanding, some of them very respectable in size and likely to close.**

**• July was fair in Cincinnati even though some good prospective buyers are holding off until the Show. Machine plants generally are busy filling orders taken earlier in the summer. In St. Louis quiet business prevails. Orders are scarce and there is not very much demand. Here, too, prospects are holding off until the Show. The small tool business is keeping up fairly well.**

**• Chicago distributors report that July business was well up to the records of previous months this year. Some talk of waiting for the Show is being heard but there is really more worry for the dealers on delayed delivery dates. Several sales have been lost on this score already. There are no signs of the seasonal slump in Milwaukee. Machine tool men there are most optimistic over prospects for the rest of the year. In the Northwest the lumber strikes are acting as an effective brake on machinery business. Otherwise business is a little better than it has been.**

*Fifteen Pieces Per Grind*—Gear blanks of 26-28 Scleroscope SAE 4615 steel are turned at 120 ft. per min. in a Warner & Swasey turret lathe, equipped with a Stellite J-Metal tool. Depth of cut, 5/16 in., feed 0.036 in.

rate provisions prevalent under code operation. The industry does not wish to afford an opening for the contention that Government control is necessary. Increase in average hourly earnings of tool and die makers above those of 1934 is symptomatic of this condition. The recent Toledo difficulty was caused by inexperienced union leadership.

Works managers are spending considerably more time than ever before in dealing with worker representatives, explaining to them the mysteries of overhead and why jobs are lost with resulting decrease in opportunity for employment in their plants. In one stamping plant having an agreement with the operators expiring August 1, a list of the jobs lost during the present year was furnished the representatives with the reasons in each case.

### Die Making Lags

With interchange of panels and a limited number of body fronts and rears among the larger producers, die business is not up to the level of former years, despite the fact that some of the larger shops are reporting business ahead of last year. With high wage rates and uncertainty of governmental action, little incentive exists to develop new things to take the place of what some owners feel to be a permanent decrease in their industry. With much of the small work done in corporation shops and a more leisurely preparation period, as is the case this year, new developments must be made if contraction in tool shops is to be avoided.

Where current operations have warranted it, some tool shops are following the policy of hiring young unskilled operators as apprentices and placing them with older employees for breaking in on Kellers, shapers and other operations in the absence of more formal apprentice training. Satisfaction with this method of operation is reported.

Two companies, Packard and Hudson, have reported operations on a profitable basis for quarter ending June 30. Shipments of Packard cars in June were 6,513, a record for the company; July production is scheduled at 6,400 to match unfilled orders. Additional equipment has already been purchased to increase output and more is in prospect to be introduced here and there throughout the shop.

Bondholders, creditors and trustee having come to an agreement, the manufacture of 10,000 Willys-Overland cars began the middle of July. This will employ 3,000 workers to November 1.

## Germans Plan Export Subsidy To Regain Foreign Markets

BERLIN—Large-scale government investments in public works, auto highways, munition factories and huge expenditure on armaments have for the last two years determined the volume and pace of German industrial production. These factors have more than offset the loss of foreign business and the decline of export trade, which the subsidies paid by the government have been unable to stop.

In April, 1935, the general industrial production index reached 94.5 (1928 = 100) against 79.4 in the corresponding month of last year and a depression low of 54.0 in 1932 (monthly average). Capital goods industries are above the average with an index of 98.8, while consumers goods are still lagging behind with 84.2, which is due, in part, to the severe restrictions on the use of imported raw materials, notably textiles.

In the capital goods group, the machinery industry is showing the largest gains. According to a preliminary estimate of the VDMA (German Machine Builders' Association), the industry operated at 71 per cent capacity during the first half of 1935; this is 30 per cent higher than a year ago. Significantly, certain internal shifts have taken place recently. Production and sales of machinery for the leather and shoe industry show a downward trend. This also applies to other machines for the manufacture of consumers' goods, especially in lines where the government has laid a ban on the erection of new plants and the extension of old ones. In the textile machinery trade a certain compensation is provided by machinery orders for the four new "regional" factories for the production of "Vistra" and other artificial fiber, of which the plant of the Glanzstoff Co., under construction at Cassel, is the most important one.

On the other hand, builders of machine tools and construction machinery are still operating almost at capacity and are working hard on munition and other government orders. A new stimulus will be offered to industry by the announcement of the naval construction program for the year 1935 which has been drafted in accordance with the new German-British naval agreement. It provides for the construction of 120,000 tons, including two battleships of 26,000 tons each and 28 submarines.

Automobile industry continues to benefit by Hitler's motorization plans. So far there has been no indication of slackening demand and each month brings new production and sales records. Automobile sales in May were 9 per cent. above April and 28 per cent. above the 1934 level. Total 1935 production is conservatively estimated at 200,000 units, (passenger cars and trucks), as against 170,000 in 1934 and a depression low of 54,000 in 1932. It is no secret that the new German army will show from the start a rate of "motorization" unsurpassed by any other country. Therefore, government orders will probably play a still greater role in maintaining the present rate of operation in 1935 and 1936 than they have done in the past.

### Financing a Weak Spot

This picture of all-round prosperity presents, however, certain weak spots which are the cause of no little apprehension in business circles. In the absence of a normally functioning capital market, the huge government expenditure on public works and rearmament has heretofore been financed almost exclusively by the issue of short-term paper now congesting the portfolios of public and private banks. Savings banks, insurance companies and similar institutions have been forced to buy government obligations almost to

capacity. Financial experts foresee that the saturation point in regard to present methods of financing may be reached sometime next winter. Scaling-down on public works—a course almost precluded by political and social considerations—or else open currency inflation is the alternative which is looming in the background of the present hazardous recovery experiment.

### Low Export Quota

In contrast with the government financed domestic boom, German machinery exports continue to make a poor showing. Both quantities and values of exports declined further during the first half of 1935. The value of total machinery exports during January-May, 1935, dwindled to 145,000,000 marks as against 161,000,000 in 1934 and 405,000,000 marks in the depression year 1931 (when foreign sales were boosted by record exports to Soviet Russia).

Significantly, the "export quota" of the machinery industry—ratio of foreign orders to total orders—showed a catastrophic decline from 56 per cent. in 1931 to 16 per cent. in 1934. Continued decline of export trade and improved domestic business point to a further drop in the export quota during the first half of 1935.

According to a recent estimate of the Bureau of Business Research, out of a total of 590,000 workers employed in machinery building in 1929, 250,000 were working on export orders. At the end of 1934, the respective figures were 520,000 and 60,000. These figures suggest that a further rise in machinery production is conditional upon recovery of foreign business, all signs of which are lacking for the time being. Germans believe that Great Britain has snapped up the greater part of export business which they lost to their competitors. The decline of German machinery exports in 1934 by 15 per cent. contrasts with a gain of 18 per cent. in British machinery exports.

### Smaller Tools Preferred

A closer scrutiny of machine tool exports in the first four months of 1935 indicates that foreign orders are concentrating on small, handy lathes, milling machines and punch presses. While the number of machine tools exported shows a decline by only 6.1 per cent (from 75,868 to 71,209), the decrease in weight is 57 per cent (from 31,287 to 13,321 tons) and in value 36 per cent (from 35,630,000 to 22,684,000 marks). In regard to metal-working machine tools alone, the average weight of an exported machine fell from 392 kg. in 1934 to 164 kg. in 1935, and the average price declined from 449 to 287 marks, respectively.

### New Subsidy Plan

Dr. Schacht's new plan for subsidizing exports, which is gradually materializing, means a new drive for recovering at least some of the losses of German machinery sales in foreign markets. Characteristically, its details are surrounded with the greatest secrecy, and all discussion of the plan in the German press is tabooed by the government. Yet, the following features of the plan can be stated with reasonable certainty:

1. Each industry has been "requested" to contribute a definite amount toward an export subsidy fund of some 750,000,000 marks. The contribution of the machinery industry approximates 150,000,000 marks. The industry is not allowed to shift this levy to the domestic consumer by raising prices. Therefore, it is bound to absorb not only the profits, but in certain cases, even part of the reserves of individual corporations.

2. As heretofore, there will be no "flat rate" of export subsidy payable for all machinery exported from Germany. Payment will be "individualized," *i.e.*, the exporter or manufacturer will have to prove that he cannot close the deal at the regular world market price. The government will then allow him a subsidy of 20, 30 or more per cent of the sales price, as the case may be. Thus, there will be no essential change in the present method of export subsidies; only the means now provided by the ingenious and intricate device of scrip and bond repurchase at low prices (which, in the last resort, makes German foreign creditors pay for the game), will in future be supplied by a levy on the industry itself. The probability is, however, that the German machinery industry —in the past the country's best export industry—will get more than its fair share from the new common "subsidy pot" and that, therefore, foreign machinery builders will have to look forward to a serious intensification of Germany's price competition in their own as well as in third markets.

## PERSONALS

JOHN W. BLACKFORD, for many years associated with the Torrington Co., of Torrington, Conn., has joined the organization of J. N. MOYER, Philadelphia, Pa.

KENNETH H. CONDIT, editor of *American Machinist*, has been appointed a member of the Committee on Medals of the American Society of Mechanical Engineers. Other members of this committee include the present Committee on Awards and the following, many of whom have served on the awards committee in the past: E. O. EASTWOOD, A. M. GREENE, JR., D. C. JACKSON, R. H. FERNALD, R. V. WRIGHT, R. H. SIBLEY, J. H. HERRON, J. LYLE HARRINGTON, F. M. GUNBY, H. C. MEYER, JR., J. W. PARKER, C. L. BAUSCH, E. R. FISH, L. W. WALLACE.

SIDNEY DIAMANT, president of the Diament Tool & Mfg. Co. Inc., 401 Mulberry St., Newark, N. J., and president of the Hudson River Valley Division has been elected a trustee of the National body of the Special Tool, Die & Machine Shop Inst.

W. R. FRAZER, formerly with Halcomb Steel Co., Syracuse, N. Y., and Eclipse Aviation Corp., East Orange, N. J., is now associated with the Union Twist Drill Co., Athol, Mass., as metallurgist. Mr. Frazer is a graduate of Michigan and did graduate work at M.I.T. and Harvard.

OSCAR HARMER, of Alfred Herbert, Ltd., one of the most widely known British machine tool men and one of the oldest still in harness, made a flying visit to New York last week and dined with a group of his American machine tool friends.

ARTHUR F. HEBARD, has been elected executive vice-president of Dardelet Threadlock Corp., New York. Mr. Hebard, as industrial consultant, has previously been associated with Remington Arms Co., Savage Arms Corp., Noiseless Typewriter Co., Gorham Mfg. Co. and Gorham Co.

DAVID J. JOSEPH, president David J. Joseph Co., has sailed for Europe. Mr. Joseph left July 10 and is contemplating opening European markets for the exportation of scrap materials.

GEORGE J. KELLER has joined the R. L. Crane Machinery Co., Buffalo, N. Y., as sales engineer. Mr. Keller was formerly Western New York representative of the Jones & Lamson Machine Tool Co.

J. R. STONE, who has been on the Pacific coast, has returned to Detroit and joined the C. C. Howarth Machinery Co.

A. B. Bok, formerly special service and development engineer of the Cincinnati Milling Machine Co., has joined the Kent-Owens Machine Co., and will do development work.

# OBITUARIES

WILLIAM H. POWELL, electrical engineer and identified with the Allis-Chalmers Mfg. Co., Milwaukee, for 27 years, died July 8, at the age of 68. Mr. Powell was born in London and came to America in 1870. He was a graduate of Cornell University. In 1890 Mr. Powell joined the Bullock Mfg. Co., until 1908 and the acquisition of the Bullock Co. by Allis-Chalmers Mfg. Co.

FREDERICK HART, manufacturer, died at Poughkeepsie, July 25, aged 86. Mr. Hart had founded the Hart Mfg. Co. there and was largely instrumental in bringing the de Laval Separator from Sweden to the United States.

FRANK HAMACHECK, SR., president of Hamacheck Machine Co., Kewaunee, Wis., died July 18. Mr. Hamacheck was born in Austria and came to America in 1867. He is the originator of the pea harvesting and vining machine.

# BUSINESS ITEMS

Milholland Sales & Machine Co., Indianapolis, Ind., has appointed Addy and Luby Machinery Co. as exclusive agents for sales of machine tools in the Detroit territory.

Norton Co., Worcester, Mass., has formed a new Italian branch to manufacture grinding wheels and abrasive articles as required in that market. Associated with the Norton Co., will be the Societa Anonima Produzione Mole Abrasive Richard Ginori. Operations of the present plant at Corsica will continue without interruption, but buildings and machinery will be modernized gradually until all varieties of Norton wheels can be produced.

Sarco Co. Inc., 40 E. 34 St., New York, is equipping a new factory for the production of steam traps and temperature control apparatus.

The United States Government is in the market for shop tools and equipment for general auto and truck repairing at various camps throughout the 8th Corps Area, Oklahoma, Arizona, New Mexico and Texas.

Contractors and manufacturers should communicate with Quartermaster General, Washington, D. C., and request that their names be placed on the mailing list in order that bids may be submitted when desired.

Thomas W. Ward, Ltd., Sheffield, England have purchased the Ford City, Pa., plant of Gears & Forgings, Inc. The sale includes the plant, machinery and equipment, working drawings and manufacturing rights.

# PATENTS

## July 16, 1935

### Metal-Working Machinery

Boring Machine. John S. Barnes and Paul R. Guirl, Rockford, Ill. Patent 2,007,953.

Grinding Machine. Frederick E. Gardner, Beloit, Wis. Patent 2,007,967.

Turret Lathe. William H. Foster, Elkhart, Ind. Patent 2,008,010.

Lathe. William H. Foster, Elkhart, Ind. Patent 2,008,011.

Fluid Pressure Operated Machine Tool. William H. Foster, Elkhart, Ind. Patent 2,008,012.

Machine for Cutting Cams. Louis Malkovsky, Floral Park, N. Y., assigned to Sperry Gyroscope Co., Inc. Patent 2,008,027.

Machine for Measuring and Machining Frames and Underframes of Vehicles, Especially Railway Bogies. Ludwig Müller, Cologne, Germany. Patent 2,008,083.

Centrifugal Casting Machine. Karl Weber, Geisweid, Siegen, Germany. Patent 2,008,196.

Broaching Machine for Shift Rods. William A. Hart, Detroit, Mich., assigned to Colonial Broach Co. Patent 2,008,208.

### Tools and Attachments

Device for Mounting Valve Seat Inserts. William G. Calkins, Detroit, Mich., assigned to Chrysler Corp. Patent 2,008,002.

Operating Mechanism for Turret Lathes. William H. Foster, Elkhart, Ind. Patent 2,008,013.

Sizing Device for Grinding Machines. Daniel Gurney, Waynesboro, Pa., assigned to Landis Tool Co. Patent 2,008,137.

Explosive Operated Tool. Phillip E. Littlehale, Middletown, Conn., assigned to Frederick A. Pearson. Patent 2,008,362.

### Processes

Process of Welding Cast Iron and Welding Rod for Said Purpose. Ture Robert Haglund, Stockholm, and Stig Johan Alvar Ingemar Harlitz, Wargon, Sweden; said Harlitz assigned to said Haglund. Patent 2,008,447.

## July 23, 1935

### Metal-Working Machinery

Apparatus for Recutting Helicoidal Gears. William F. Zimmermann, Maplewood, N. J., assigned to Gould & Eberhardt. Patent 2,008,740.

Milling Machine. Peter P-G. Hall, Philadelphia, Pa. Patent 2,008,757.

Galvanizing Apparatus. Albert Bradley, Sterling, and Edward T. Foley, Rock Falls, Ill., assigned to Northwestern Barb Wire Co. Patent 2,008,813.

Apparatus for Annealing Wire. Albert F. Bradley, Sterling, Ill., assigned to Northwestern Barb Wire Co. Patent 2,008,814.

Machine Tool Transmission. Edward J. Kearney, Wauwatosa, Wis., assigned to Kearney & Trecker Corp. Patent 2,008,983.

Centrifugal Casting Machine. William D. Sargent, New York, N. Y., assigned to Durafer (Inc.). Patent 2,009,025.

Board Drop Hammer. Macdonald S. Reed, Erie, Pa., assigned to Erie Foundry Co. Patent 2,009,150.

Machine for Operating on Needles. James Baxter, Glasgow, and William Tivendale, Clydebank, Scotland, assigned to the Singer Manufacturing Co. Patent 2,009,287.

Machine Tool. Edward P. Burrell, Shaker Heights, Ohio, assigned to the Warner & Swasey Co. Patent 2,009,354.

### Tools and Attachments

Tool for Counterboring or Spot Facing. Albert B. Dettmer, Rocky River, Ohio, assigned to the National Tool Co. Patent 2,009,168.

Welding Rod. Aubrey Thomas Roberts and John Hamilton Paterson, Walthamstow, London, England. Patent 2,009,240.

# MEETINGS

AMERICAN FOUNDRYMEN'S ASSOCIATION. Thirty-ninth annual convention, Aug. 19-23. Royal York Hotel, Toronto, Ont. C. E. HORT, secretary, 222 West Adams St., Chicago, Ill.,

AMERICAN SOCIETY FOR METALS. Seventeenth annual meeting, Sept. 30-Oct. 4. Palmer House, Chicago, Ill., W. H. EISENMAN, secretary, 7016 Euclid Ave., Chicago.

AMERICAN WELDING SOCIETY. Fall meeting, Sept. 30-Oct. 4. Chicago, Ill. M. M. KELLY, secretary, 33 West 39th St., New York, N. Y.

ASSOCIATED MACHINE TOOL DEALERS. Annual meeting, Sept. 9. Cleveland Hotel, Cleveland, Ohio. HARRY BARNEY, secretary, Koppers Bldg., Pittsburgh.

ECONOMICS CONFERENCE. Fifth annual for engineers, Aug. 10-17. Stevens Engineering Camp, Johnsonburg, N. J. For reservations, Stevens Institute of Technology, Hoboken, N. J.

INTERNATIONAL ACETYLENE ASSOCIATION. Thirty-sixth annual convention, Nov. 12-15. Cleveland Hotel, Cleveland, Ohio. H. F. REINHARD, secretary, 30 East 42d St., New York, N. Y.

NATIONAL INDUSTRIAL ADVERTISING ASSOCIATION. Convention, Sept. 18-20. William Penn Hotel, Pittsburgh. W. J. RAMSEY, Industrial Advertising Council, Box 1198, Pittsburgh, Pa.

NATIONAL METAL EXPOSITION. Seventeenth annual congress, Sept. 30-Oct. 4. International Amphitheater, Chicago, Ill., W. H. EISENMAN, secretary, 7016 Euclid Ave., Cleveland.

MACHINE TOOL CONGRESS. Cleveland, Sept. 11-21. Under auspices of National Machine Tool Builders' Association. Participating societies: Machine Shop Practice Division, American Society of Mechanical Engineers; Production Activity Division, Society of Automotive Engineers; American Society of Tool Engineers. HERMAN H. LIND, general manager, 1220 Guarantee Title Bldg., Cleveland.

MACHINE TOOL SHOW. Sept. 11-21, Public Auditorium, Cleveland, Ohio. HERMAN H. LIND, general manager, 1220 Guarantee Title Bldg., Cleveland.

SILVER BAY CONFERENCE. Eighteenth annual conference on industrial relations, August 28-31. Silver Bay, Lake George, New York, N. Y. E. C. WORMAN, executive secretary, 347 Madison Ave., New York, N. Y.

WIRE ASSOCIATION. Annual meeting, Sept. 30-Oct. 4. Chicago, Ill. RICHARD E. BROWN, secretary, 17 E. 42d St., New York, N. Y.

American Machinist REFERENCE BOOK SHEET ©

# Electrodeposited Coatings of Cadmium on Steel

The specifications in this tentative standard are published through the courtesy of the American Society for Testing Materials. They were prepared by that Society in cooperation with the American Electro-Platers' Society and the National Bureau of Standards.

### Scope

1. These specifications cover requirements for electroplated cadmium coatings on steel articles that are required to withstand corrosion. Two types of coating (Notes 1 and 2) are covered: namely,

*Type NS.*—For general service.

*Type TS.*—For mild service.

NOTE 1: *Explanation of Symbols.*—The initial letters *N* and *T* were adopted as arbitrary designations of grades of plating. The second letter (*S*) refers to steel as the base metal; to provide for other base metals such as brass (*B*) and zinc (*Z*).

NOTE 2: *Classification.*—The conditions of exposure and use of plated steel are so varied that it is not possible to predict the average life of articles plated in accordance with Type *NS* or Type *TS*, or to predetermine just which type of plating should be specified for a given article. Such a selection must be based upon the experience of the manufacturers and users.

It is recognized that uses exist for which thicker coatings than those of Type *NS* will be required.

For articles that are intended for a short period of use, no standard specification for plating is recommended. It is suggested, however, that subject to the prevailing manufacturing conditions, certain minimum requirements be mutually agreed upon by the manufacturer and purchaser in order to insure that the plated coatings render a useful service.

### Manufacture

2. The steel to be plated shall be substantially free from flaws or defects that will be detrimental to the appearance or the protective value of the coatings. It shall be subjected to such cleaning, pickling and plating procedures as are necessary to yield deposits with the desired quality. The cadmium coating shall have a uniform appearance, bright or dull as specified, shall be adherent and free from blisters and substantially free from other defects that may affect the appearance or protective value of the coatings.

### Minimum Thickness of Deposits

3. (*a*) *Type NS.*—On significant surfaces of the finished articles, the minimum thickness of Type *NS* cadmium coating shall be 0.0005 in.

(*b*) *Type TS.*—On significant surfaces of the finished articles, the minimum thickness of Type *TS* cadmium coating shall be 0.00015 in.

### Thickness Measurements

4. The minimum thickness of the cadmium coating shall be determined by microscopic examination of cross-sections taken perpendicular to significant surfaces, or by other methods as agreed upon by the manufacturer and purchaser.

### Significant Surfaces

5. In general, significant surfaces are those surfaces that are visible and subjected to wear and/or corrosion. The designation of significant surfaces shall be agreed upon by the manufacturer and purchaser, and may be indicated on the drawings.

### Sampling

6. Methods of sampling and resampling and the basis of rejection shall be subject to mutual agreement by the manufacturer and purchaser. The number of samples to be selected and the frequency of selection will, in general, depend upon the number of pieces to be plated.

## Appendix

### Time Required for Plating

Any specified thickness of plating can be produced consistently only if the current density and time of plating are controlled. Regulation of the voltage is of no value except so far as it produces the desired current density.

The average thickness of deposit that is required to produce a specified minimum thickness of deposit will depend upon the shape of the article, the shape and position of the anodes, and the throwing power of the solution. Purely for illustration, it will be assumed that the average thickness will be 50 per cent greater than the minimum thickness. The resultant figures serve only as a rough guide and must be confirmed by trial.

### Current Density

To deposit 0.001 in. of cadmium with high efficiency, it requires about 10 amp. hr. per sq.ft. To produce an average thickness of 0.00075 in. (that is, 50 per cent more than the minimum thickness of 0.0005 in. specified for Type *NS*), it will therefore require about 7.5 amp. hr. (450 amp. min.) per sq.ft. This is equivalent to one hour's plating at 7.5 amp. per sq.ft., or to a corresponding period for any other current density. Similarly, for Type *TS* it will require about 2.5 amp. hr. per sq.ft. to deposit an average of 0.00023 in. of cadmium (or a minimum of 0.00015 in.).

For complicated shapes, longer periods will be required. When a large number of small articles are plated simultaneously (for example, on a rack or in a barrel), the time of plating must be increased to insure the specified thickness on those articles that receive less than the average current density.

# Broaches and Broaching Fixtures

J. A. POTTER

A simple type of broaching fixture is illustrated in Fig. 1, where the work being held is to have a keyway broached in the hub. The work is not clamped in place because the pulling action of the broach keeps it in contact with the fixture. The fixture is located on the machine by the short pilot *A* and is attached with screws. The work is held on the horn *B* in which the slot *C* serves as a guide for the broach.

If a keyway deeper than the height of the steps on the broach is to be cut, the cut can be made in two operations, as shown in Fig. 2. In the first operation, the cut is made as deep as the steps on the broach will permit. Then the gib-head shim *A* is inserted in the bottom of the slot and under the broach, raising the broach enough to make the keyway the correct depth in the second cut.

A new type of propellor hub having six splines had to be furnished with a batch of airplane engines that had been inspected and was ready for shipment. Since it was impossible to secure a six-spline broach of the required accuracy in time to prevent a serious delay in shipment, the simple indexing fixture shown in Fig. 3 was devised. The use of this fixture in connection with a single broach enabled the six splines to be broached satisfactorily. The design of the hub called for six holes in the flange for lightness. Five of these holes were drilled to the size specified, but the sixth hole was drilled and reamed $\frac{1}{32}$-in. smaller than the others. Six pins to fit the smaller hole, were spaced equally in the fixture. The work is located by one of the pins engaging the smaller hole and in this position the first spline was broached. The hub was removed and replaced so that the next pin engaged the same hole, then the second spline was broached, and so on until the six splines were finished. Since the pins in the fixture were smaller than five of the holes in the hub, the hub cleared them in each position and there was no interference in indexing.

When the thickness of work to be broached is less than the pitch of the teeth on the broach, the teeth should be cut on an angle, as shown in Fig. 4. The angle of the teeth should be such that the advancing tooth will enter the work before the receding tooth has left it, thus eliminating the chatter that would be caused by the jump from tooth to tooth.

Broaches that are thin in proportion to their length are subject to a whipping action as they are pulled through the work. It is good practice to make such broaches as short as possible and to have two or more with increasing height of steps, and to broach the work in two or more operations.

A formed broach for broaching holes having parallel sides is shown in Fig. 5. It is made so as to broach the sides of the hole first, the bottom next, and the form at top last, the one broach taking care of the three stages in the operation. The non-cutting surfaces of the broach between stations are relieved to permit the broach to be guided without unnecessary friction.

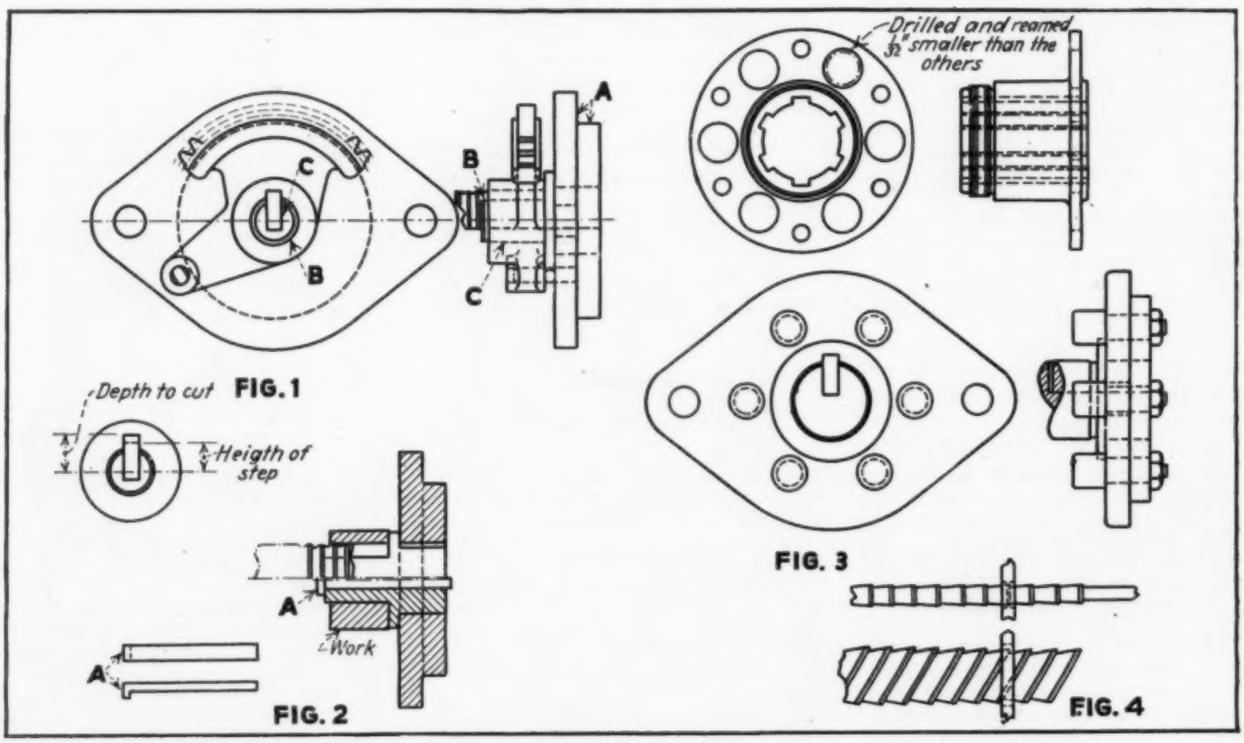



*Fig. 1—A typical simple broaching fixture. Fig. 2—Method of cutting a keyway deeper than the heights of the steps on the broach. Fig. 3—Indexing fixture for broaching six splines in propeller hubs. Fig. 4—Broach having angular teeth for thin work*

Broaches so made will produce holes of irregular shape with great accuracy.

A floating fixture is illustrated in Fig. 6. The work to be broached is a rough casting having a square, cored hole. The inner surface of the plate against which the work bears is spherical in shape and fits in a seat of similar contour. A pin keeps the plate in correct position in relation to the broach, and three flat springs hold it in its seat, permitting it to float enough to compensate for irregularities in the face of the work.

Work that cannot be located on a horn in the fixture can be placed in a nest, as shown in Fig. 7. The nest plates are so located that the chips can easily be wiped from them. Although most of the chips will be drawn through the fixture with the broach, some may fall from the broach as it is being removed prior to being inserted for the next piece, and the oil will often hold foreign particles that may lodge on the plates and interfere with the correct location of the work.

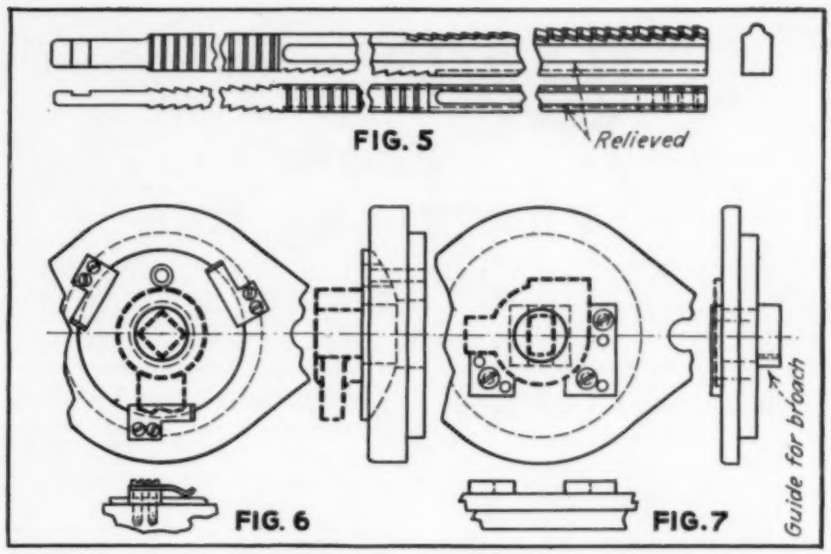



*Fig. 5—Broach for broaching a formed hole having parallel sides. Fig. 6—Floating fixture to compensate for irregularities in rough work. Fig. 7—Fixture having a nest instead of a horn for locating work*

# A Plan for Marketing Durable Goods

## Discussion

JOHN R. GODFREY

I was much interested in the leading article (*AM*—Vol. 79, page 481), especially the reference to the United Shoe Machinery Company's method of leasing special machines instead of selling them. The indorsement of the plan by Mr. Lazarus pleases me because I have made more or less a nuisance of myself for many years advocating this method to builders of such highly productive machines as make our automobile shops the eighth wonder of the world. Some of my ideas along this line have been published in the *American Machinist* from time to time over quite a period of years.

One of my machine building friends tried one of my compromise suggestions, I believe, but didn't succeed in putting it over. This was to have one price for outright purchase or a considerably lower down payment, plus a percentage of the savings over a five-year period. I'm not especially proud of this compromise but the suggestion was made at a time when production men were up against a padlocked check book when they wanted new machines. And it was thought that the bait of a lower first price might have the desired effect. It didn't—at least in this case.

Now that Mr. Lazarus has opened the question again it may be a good time to air the idea once more in the hope that the machine builders will at least study the question carefully. Although I don't build machines myself I've been so close to the industry for many years and have seen users of their machines reap so much larger rewards than those who invented, designed and built them, that I want to see them wake up and get their share of what they produce.

Leave all but special machine tools out of the picture for the moment and consider those which of necessity have a very limited market—a crankshaft lathe, for example. As a guess I would say that no builder of such a special machine expects to sell 200 all told, scattered over a 10-year period. Of course the builder sets a price as high as he can get but this is limited in many cases by the P.A.'s rule that a new machine must pay for itself in two years, one year, or even 90 days in some cases. So, no matter how high the price paid the builder, the user's return runs from 50 to 400 per cent on the investment. The builder would like to invest his profit at a similar rate.

The enviable record of the United Shoe Machinery Company as shown on page 483 would gladden the hearts of machine tool builders in general. And it may be pertinent to ask who deserves such a condition more? Without the present development of machine tools where would the makers of automobiles, radios and even the United Shoe Machinery Company be?

As Mr. Lazarus points out, the plan of leasing machines has advantages to the user as well as the builder. It assures more nearly maximum output, fewer delays from breakdowns and less danger of obsolescence. It also helps the small shop which cannot afford to buy the machines outright.

The cartoon heading the article and the caption should be carefully studied by both builders and users of machine tools. If the builders get together on a rational method of leasing high production machines they can do much to stabilize the business of building the "master tools of industry."

# Ideas FROM PRACTICAL MEN

## Jig for Drilling and Spot Facing an Offset Lug

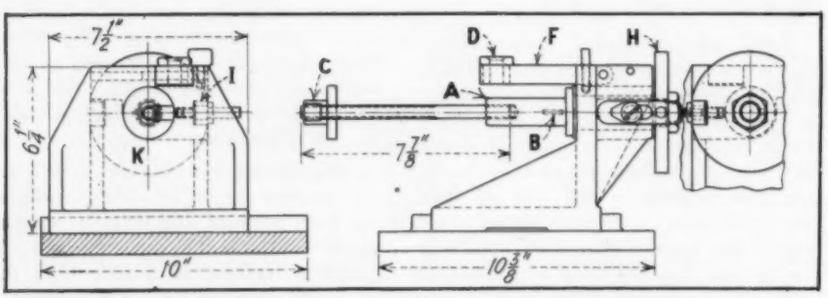
CHARLES C. TOMNEY
*Chief Tool Designer*
*Carrier Engineering Corporation*

In assembling a quantity of hollow, sectional, three-way eccentric shafts, it was necessary to drill a ⅞-in. hole in an offset lug for a clamping bolt and to spot face both surfaces of the lug as seats for the head and the nut of the bolt. For this work, the jig illustrated was designed, and its outstanding feature is, that all the operations are performed without removing the work.

The work is slipped over the stud *A* and is located by the key *B* engaging a keyway in the bore. It is secured by the nut *C*. A C-washer placed under the nut permits placing and removing the work on the stud without removing the nut.

In operation, the drill is guided by the bushing *D* in the hinged bushing plate *F*. After the hole has been drilled, the thumbscrew *H* is turned so that its wings clear the bushing plate, which is then swung up out of the way of the spot-facing tool. When the uppermost surface of the lug has been spot faced, the plunger *I* is pulled out of the slot in the index plate *K* and the work is indexed 180 deg. The plunger is then pushed into the opposite side of the index plate, completing the indexing.

To spot face the surface of the lug now uppermost, the jig must be moved, because the lug being offset is now on the opposite side of the center from where it was during the first operation. The base of the jig is slidably mounted in a sub-base attached to the drill press table, the slide being at a right angle to the axis of the work. All that is necessary is to slide the jig in the sub-base until the ⅞-in. hole is in line with the pilot on the spot-facing tool.




***Since the lug is offset, indexing the work 180 deg. brings it on the opposite side of the center, necessitating moving the jig for spot facing the second side***

## A Simple Section Liner

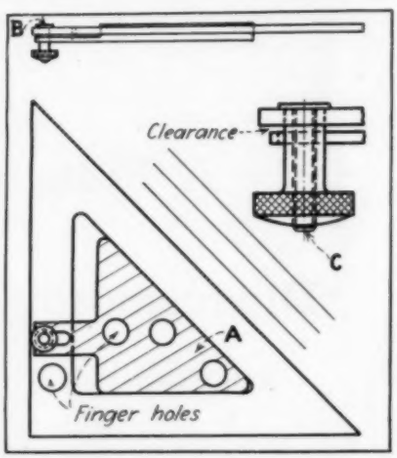
WILLIAM M. HALLIDAY
*Baildon, Yorkshire, England*

The modified triangle for section lining described by S. O. Dodge in an article under the title given above (*AM*—Vol. 78, page 748) is very simple and can be made quickly. In spite of these advantages it is doubtful if it will commend itself to many draftsmen because the number and size of the holes limit the necessary variations in section lining.

Unless the pencil point is located at each time accurately across the diameter of the holes parallel with the base of the triangle, the triangle will not be moved the same distance at each step. Placing the fine point of the pencil in the holes, especially the smaller ones, will endanger breakage of the lead. Furthermore, the pencil will make a series of small marks on the paper unless care is used.

As an improvement, I suggest the device illustrated. A triangular insert *A* having an extension at one side is placed in the opening of the triangle, the extension having a slot ¼-in. wide and ½-in. long. A slot of the same length but ⅜-in. in width is made in the vertical leg of the triangle. Fitting freely but not rotating in the slot in the triangle is the stud *B*. The threaded end of the stud passes through the slot in the extension of the insert, as does also the shank of the locking nut shown enlarged at *C*, the shank being allowed free movement in the slot in the extension. Thus the stud can be locked in any desired longitudinal setting in the triangle while the insert is free to move horizontally for a limited but variable distance.

The insert is of sufficient thickness for its bottom surface to project about 0.010 in. below the bottom surface of the triangle, enhancing the ease of sliding movement to both parts. Finger holes are drilled as shown, three in the insert and one in the triangle.




***The movement of the insert is limited by the position of the stud in the triangle. Varying the position of the stud permits different spacing of the section lines***

Before use, the stud *B* is locked in the triangle to permit the insert the desired amount of movement to coincide with the section spacings wanted. This distance is measured for between the slanting edge of the insert and the inner slanting edge of the triangle when the insert is in the extreme left-hand position.

In use, the tips of the three first fingers are placed in the holes in the insert and the tip of the small finger is placed in the hole in the triangle, and the insert is moved to the extreme left position. In this position a section

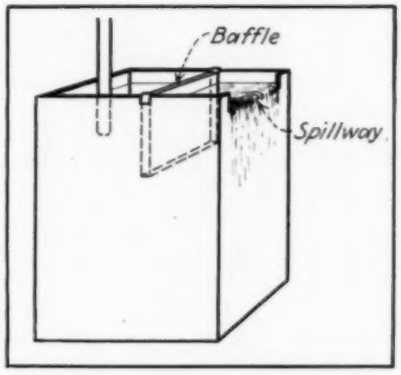
line is drawn. Then the triangle is moved to the left as far as is possible, holding the insert stationary, and the second line is drawn. The same process is repeated until the sectioning has been completed.

## Keeping Coolant Pumps Clear of Chips

LEONHARD ENZINGER

On machines equipped with overflow tanks and reservoirs, we had trouble from chips getting into and clogging the geared pumps. Observation showed that many chips would float on the surface of the coolant and be carried by the overflow down into the reservoir, from where they were sucked up into the pump, interfering with the flow of coolant.

We cured the trouble by cutting a spillway on one side of each overflow tank about an inch from the top and placing a baffle extending from the top




*The spillway permits overflow of the coolant at one point only and the floating chips behind the baffle are given time to settle*

to a few inches below the level of the coolant, as shown in the illustration. Thus the floating chips were kept behind the baffle until they had time to settle.

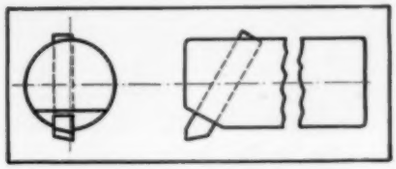
## Three Types of Boring Bars for Turret Lathes

EDWARD GREENSPON

In an article under the title given above (*AM*—Vol. 79, page 58), F. Server relates a conversation in regard to tooling for a turret lathe, in which the foreman said, "Use a plain boring bar," Mr. Server asks "Just what type of bar did he mean"? and continues, "He may have meant a bar having either a single or a double-point cutter, or a piloted bar," and then proceeds to describe and illustrate three boring bars, all of which are essentially of the same design.

It occurs to me that Mr. Server not only neglected to answer his own question definitely, but missed an opportunity of presenting his views as to the proper nomenclature for various types of boring bars for enlarging and finished cored holes.

Any of the methods for clamping the cutters in the bars illustrated by Mr. Server will hold them satisfactorily, the difference between them being that bars *A* and *C* can be used for



*Plain boring bar for the turret lathe. Such a bar is commonly used for enlarging cored holes or for boring blind holes where the bottoms do not have to be faced*

through holes only, or where there are stepped holes in which the smaller holes are large enough to clear the fronts of the bars. Bar *B* can be used for blind holes and for facing the bottoms of the holes if the cutter is prop erly ground on the end.

My viewpoint is that these tools should be classed as two-lip inserted-blade core drills, since the blades are in one piece and are not adjustable for size, and the cutting action is the same as that of the conventional core drill.

My idea of the plain bar, the foreman referred to, is shown in the sketch. The bar carries a single-point tool and has no pilot. Such a bar is commonly used for enlarging cored holes and for finish boring blind holes. Overhead piloting may be employed, or for holes of large diameter the bar can be mounted on the turret face and considerably offset from the center line of the work. It may have more than one cutter for boring holes having more than one diameter at the same time, in which case it is known as a plain step-cut bar.

## An Efficient Tap Wrench

CLARENCE HOLLAND

In cleaning out tapped holes and retapping work on the assembly floor, an ordinary carpenter's bit brace makes a convenient and efficient tap wrench.

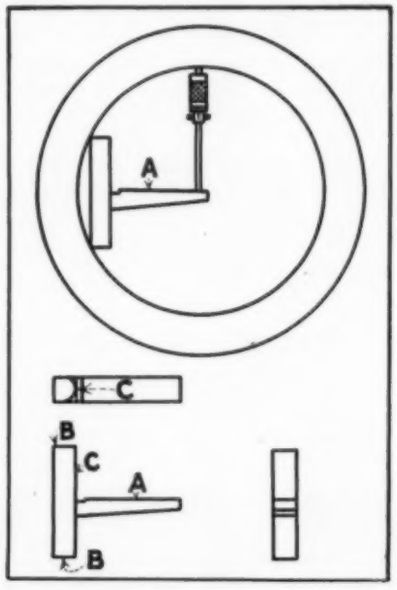
## Double Reach for Inside Mikes

FRANK MOORE
*Hamilton, Ontario, Canada*

In the illustration is shown a simple center gage that enables an inside micrometer to measure holes up to double the diameter for which it was originally intended.

It is made from ½-in. sheet steel and is cut to the shape shown. The upper Face *A* of the blade is ground accurately to the center distance between the ends *B* of the stock and at a right angle to the base of the stock.

In use, the gage is held against the wall of the hole with the fingers gripping the rounded edge *C* of the stock and the thumb against the outside of the work. Obviously, the actual diameter of any hole measured with the assistance of this center gage will be twice that shown by the micrometer.




*With this device the capacity of the inside micrometer will be doubled. The diameter of the hole measured is twice that shown by the micrometer*

## Safety in Handling Lathe Chucks

OLIVER MANN

A recent accident to a fellow workman who had a lathe chuck fall on his fingers while he was removing it from the spindle, brought to mind a simple device to prevent a repetition of this rather common occurrence.

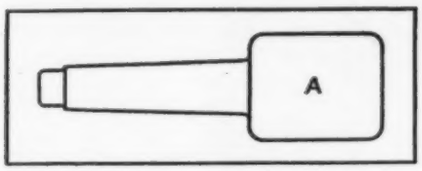
The arbor illustrated is turned to fit the taper hole in the spindle, the straight part *A* being a little longer than the threaded part of the chuck

mounting and its diameter a little less than that of the thread roots on the spindle.

In putting the chuck in the spindle, the arbor is put in place and the chuck is lifted onto it and slid along to the end of the spindle. The arbor supports the weight of the chuck and aligns it with the spindle, so that it can easily be screwed on.

In removing the chuck, the arbor is inserted through the hole in the chuck body and into the spindle. When the chuck is unscrewed from the spindle, its weight is supported by the straight part of the arbor, from which it can be lifted.

It will readily be seen that in either attaching or removing the chuck, it is supported by the straight part of the arbor, so that there is no danger of its dropping and injuring the workman's hands while engaging or disengaging the threads on the spindle.




*Mounting and removing heavy chucks is facilitated by using this arbor to support their weight*

## An Improved Sine Bar

CHARLES HATTENBERGER
*Instructor, Tool and Diemaking, Seneca Vocational High School*

In an article under the title given above (*AM*—Vol. 79, page 332), A. F. Parker describes the making of an improved type of sine bar.

Illustrated in Fig. 1 is a sine bar I made several years ago that incorporates many of the features of the one Mr. Parker describes, but differing somewhat in the details of construction. It will be noted that both the faces and the bottoms of the 90-deg. seats for the cylindrical pieces can be ground with the same side and edge of the wheel at the one set-up. The important feature is that the end thrust relationship of the wheel spindle is the same in grinding both of the vertical faces.

While no special claims are made for the superiority of this sine bar over the one described by Mr. Parker, it is believed that the arrangement of the vertical faces *B* facilitates the grinding to parallelism with less effort.

Another feature is the method of securing the cylindrical pieces to the bar, as shown in Fig. 2. The screws are entered through the bar into blind, tapped holes in the cylindrical pieces, and the heads are in counterbored recesses in the bar. The cylindrical pieces thus present uniform and unbroken surfaces to the contact point of a dial indicator or the finger of a vernier height gage.

*Fig. 1—The vertical parts of the seats for the cylindrical pieces both face in the same direction and can be ground by the same side of the wheel at the one set-up*

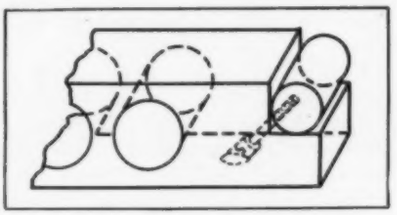


*Fig. 2—The screws for securing the cylindrical pieces to the bar are entered through the bar into blind, tapped holes in the cylindrical pieces, leaving uniform, unbroken surfaces*

## Patternmaker's Oval

JAMES McINTOSH

The patternmaker's oval described by J. I. Hommel in an article under the title given above (*AM*—Vol. 79, page 405) is rather an interesting solution. But it is neither an oval nor an ellipse.

One of my first lessons in patternmaking was to produce a true ellipse by cutting a cylinder equal in diameter to the minor axis at an angle until the lengthened surface was equal to the major axis. The angular surface was then that of a true ellipse, or oval, regardless of the ratio of the major and minor axes.

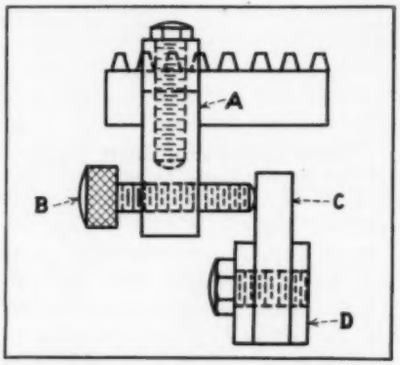
## Adjustable Shoulder Stop

JOSEPH KEMME

The illustration shows an adjustable shoulder stop that I made for a Brown & Sharpe cylindrical grinder.

Part *A* is clamped to the rack on the table used for locating the reversing dogs and contains the adjusting screw *B*. The latch *C* is pivoted in the yoke *D*, the threaded shank of which is screwed into a tapped hole in the bed. When the stop is not in use, latch *C* is swung downward, permitting clamp *A* to pass over the yoke without interference as the table travels.

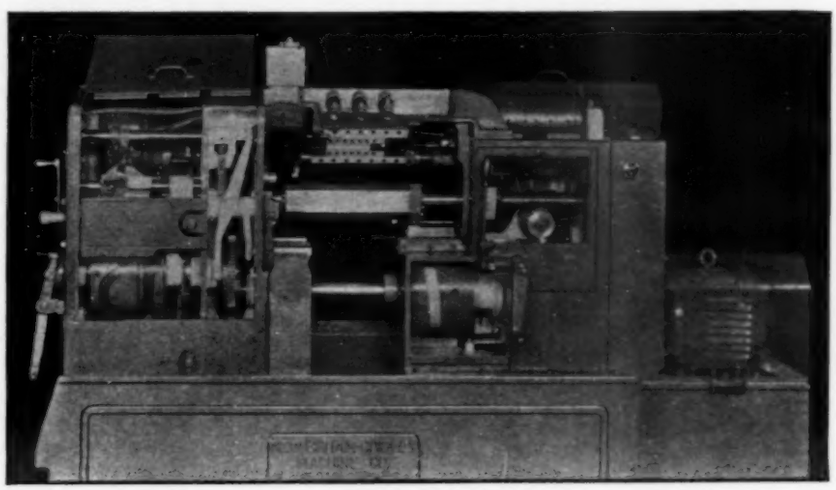
By the use of this stop, traversing the table by hand, work having two diameters can be ground to the shoulder, and the face of the shoulder can be ground to a definite distance from related parts with accuracy.




*With this stop on a cylindrical grinder, work having two diameters can be ground close to the shoulder, when the table is traversed by hand*

Shop Equipment NEWS

## New Britain Automatic Screw Machines



Initial and permanent accuracy was the fundamental aim of the engineers in designing Models 40, 41, 60 and 61 automatic screw machines announced by the New Britain-Gridley Machine Co., New Britain, Conn. Models 40 and 41 are of the four-spindle type, with the first built in two sizes, 7/8x5-in. and 1x5-in., while the latter is built in several sizes ranging from 1 3/8x6-in. to 2 1/4x6-in. Models 60 and 61 are six spindle machines, with the first built in two sizes, 5/8x5-in. and 1x5-in., and the second built in sizes to and including 2 1/4x6-in.

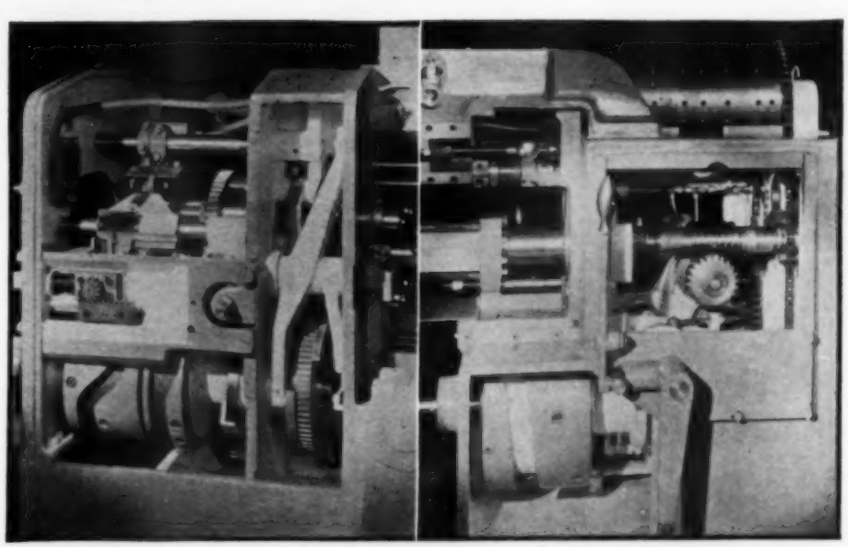
Spindles are mounted on preloaded ball bearings, are shorter than average and are large in diameter to obtain rigidity. The spindle carrier is automatically lifted from its bearing seat before indexing, and is held off of its seat during the index movement. This eliminates wear on the surfaces on which the accuracy of an automatic screw machine depends. After each indexing, the spindle carrier is clamped firmly down on its seat.

A feature of this machine is the use of forming slides mounted on hardened and ground cylindrical steel studs entirely encircled by their bearings. The slides are fitted with hardened and ground tool holder bases, T-slots of which are ground accurately to size, parallel with the axes of the spindle and fitted with micrometer adjustment. The cross slides are independently operated and actuated by cams of the flat disk type.

The tool slide is square on the four spindle models and hexagon on the six spindle models, and is actuated forward and reverse by a drum type cam through a hardened and ground roll and torque guide. This slide reciprocates on a hardened and ground steel stem, which forms practically an integral unit with the spindle carrier.

The chuck jaws are closed by special rollers instead of the usual fingers. This mechanism consists of a series of barrel-shaped rolls, held in, and actuated by, hardened and ground high carbon alloy steel actuating sleeves. When the outer sleeve is actuated by the chucking shoe, the barrel shaped rolls are forced radially toward the center of the spindle, giving axial movement to the chucking tubes. Adjusting collars for varying the chucking pressure are readily accessible.

The cut off slide and stock feed mechanism is in the upper front position. As the machine indexes clockwise, the heavy forming and drilling tools are in the two lower positions. With this arrangement, heavy chips

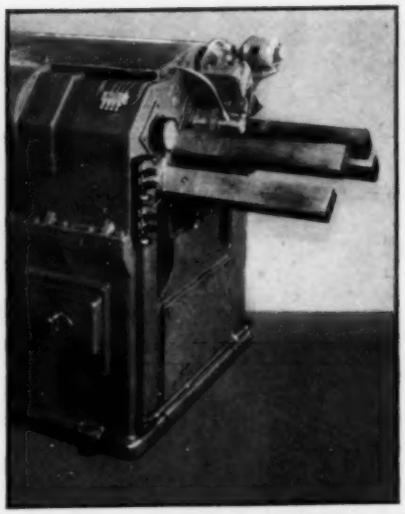


*In this machine the spindle carrier is automatically lifted and held off its bearing seat during the index movement, extending the life of the surfaces vital to the accuracy of an automatic screw machine*

from the roughing and semi-finishing tools do not fall on, or interfere with the finishing tools. The two upper positions are used almost exclusively for finishing tools. In feeding stock, if the feed fingers pull off the end of the bar, and on the forward feeding movement strike the butt end, a yielding device on the stock feed cam prevents damage. If a stock feed tube is removed from the machine, its actuating shoe is latched out, and through a switch connection with the motor, the latter cannot be started again until the latch is released and the stock feed tube returned to its normal operating position. When any spindle runs out of stock, the machine stops with the collet open, the stock stop in position and a signal light flashes to notify the operator.

A safety oil pressure switch is interconnected with the circulating lubrication system, and makes it impossible to run the machine until a predetermined pressure has been built up. Tool coolant is supplied through a low pressure centrifugal pump which floods the tools with 50-gal. of cutting oil per min.

On Models 40 and 60, speeds range up to 3,800 r.p.m., while on Models 41 and 61 speeds up to 2,500 r.p.m. are available. The machines are designed so that drill speeders can be readily installed. These speeders can be used in connection with self-opening die heads or collapsing taps in any of the working positions. Tapping spindles can be used in either of the upper positions. All of these attachments are interchangeable from one position to another, or to any other New Britain machine of a like model.



*The receiving end of the machine shows the positioning apparatus*

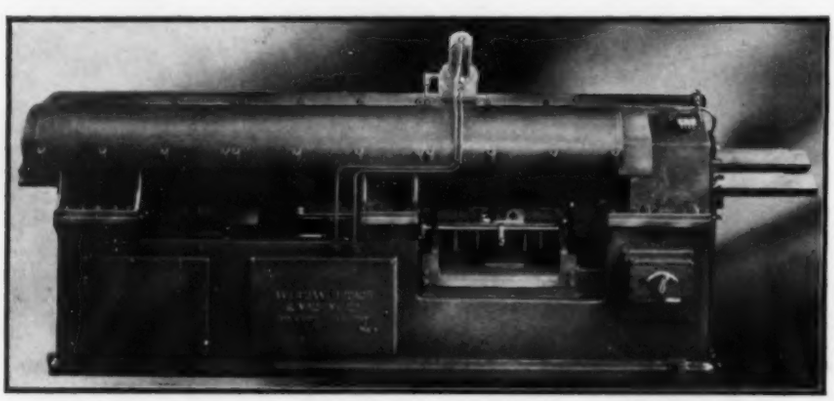
## American Automatic Cylinder-Block Broaching Machine

This automatic cylinder block broaching machine was designed and built by the American Broach & Machine Co., Ann Arbor, Mich., for broaching the eight locating spots on top of the cylinder block of a V-8 engine. These surfaces are approximately 1⅛-in. square, four on each side of the V-block, and the machining of them is the first operation on the castings.

The machine consists of two cylinders operating in slides above the position at which the work is broached, making it a tunnel-type broaching machine. These two cylinders are locked together by means of a crosshead that is held by a large key and rigidly bolted to pads that protrude from the end of the cylinder through an opening in the upper frame, causing the cylinders to move as a single unit. Heavy circular caps are provided over the slides of the cylinders. They are keyed to the upper frame for alignment and serve as guiding surfaces for the upper part of the ways on the cylinder.

The base of the machine serves as an oil reservoir, providing a capacity of approximately 60-gal. Hydraulic valves and solenoid controls are placed in the middle section of the column, and are easily accessible through a panel in the back of the machine. Two main cylinder pressure pumps are direct-motor-driven. The upper members are built on a 45-deg. angle, keyed and bolted together. Each member is provided with two slides, having hardened and ground liners and caps and fitted with tool-steel broach carriers. These carriers are approximately 90 in. long and mount the broach holder and broach.

Cylinder blocks are brought up to the receiving end of the machine by a conveyor. A small hydraulic cylinder to which a swinging arm is attached moves a block up to the proper position in the fixture. Through hydraulic means, it is automatically centered and pushed against locators that fit inside of the four bores, two at each end of the cylinder block. The main pulling rams immediately start on the cutting stroke. Upon completion of the cut, the fixture releases, lowering the cylinder block and permitting the broaches to pass back on the return stroke. Upon completion of the return stroke, another cycle is repeated, and the block previously broached keeps moving, while additional blocks are broached, until it passes out of the machine. The cycle time for this operation is 24-sec. per cylinder block. The same type of machine can be arranged to broach main bearing seats in cylinder blocks and manifold surfaces or top surfaces of cylinder blocks.

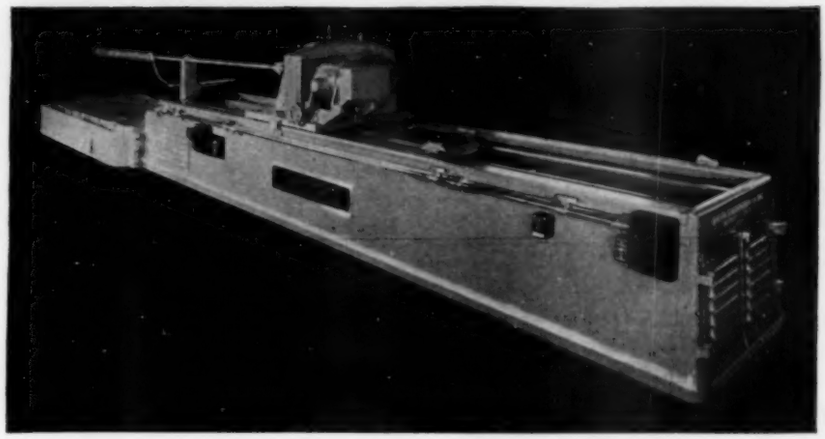


*Eight locating spots on a V-8 engine block are broached by this machine*

## Thor Portable-Tool Balancers

The Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill., has increased the capacity of its line of Thor balancers for portable tools and other suspended equipment. (*AM*—Vol. 74, page 888). Capacities now range to 200 lb. The Thor tapered drum is featured throughout the entire line and assures balance of the load at any point within the range of travel. Four sizes in the Thor line of balancers are equipped with locking and unloading devices.

# Hutto Model MH-1800-H Horizontal Honing and Lapping Machine



Internal honing of long bores to close tolerances and variable speed to suit most honing operations is made possible by the hydraulically reciprocated horizontal honing and lapping machine, known as the MH-1800-H, introduced by the Hutto Engineering Co., Inc., Detroit, Mich. The reciprocating stroke ranges from 2 in. to 13 ft. 6 in., with infinitely variable reciprocating speeds from 0 to 50 ft. per min. This motion is produced hydraulically and transmitted through gearing which is self lubricating.

In this multiple speed design, the cylinder travels considerably slower than the reciprocating table which it operates through gears. Rotation speeds for honing and lapping operations are infinitely variable from 53½ to 252 r.p.m. Length of reciprocating stroke is adjustable by means of stop limits arranged along the machine bed to prevent overrunning. These limits will not permit starting the machine in the wrong direction, regardless of what "start" is depressed.

Operation is completely automatic with an electric stroke counting and controlling device, adjustable from 1 to 999 cycles reciprocation, for automatic stopping upon completion of time for which it is adjusted. Accuracy of plus or minus 0.0002 in. on diameters is obtainable on small cylinders. Larger bores up to the 10 in. limit may be held within 0.0005 in.

Specifications of this machine are; internal diameter, 1½ to 12 in.; rotation drive motor, 7½ hp.; reciprocation drive motor, 7½ hp.; coolant pump motor, ½ hp.; overall length, 27 ft. 11 in.; overall width of bed, 4 ft.; overall height, 4 ft. 6¾ in.; weight, 24,000 lb.

## "Parkson" Gear Testers

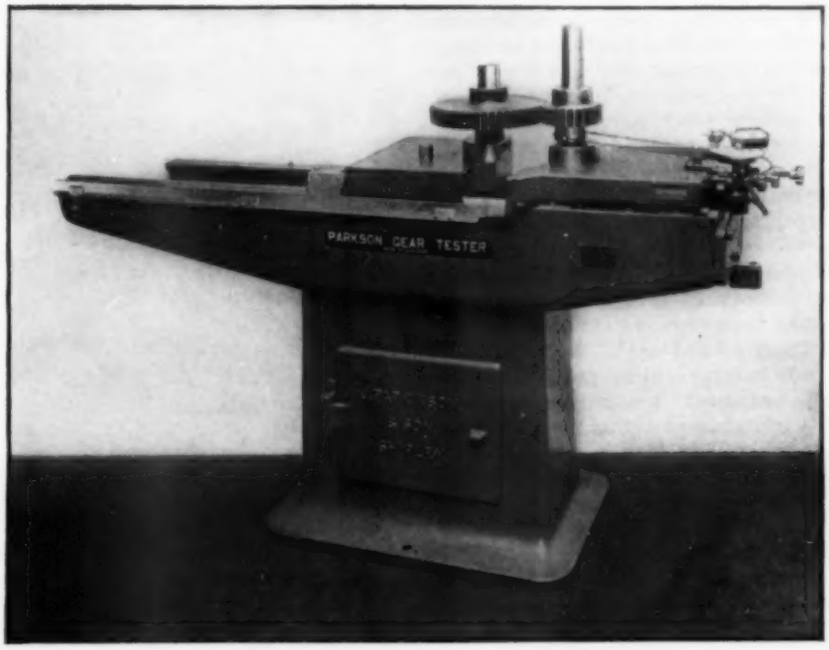
George Scherr Co., 128 Lafayette St., New York, N. Y., announces the 24- and 36-in. Parkson gear testing jigs manufactured by J. Parkinson & Son, Shipley, England. Gears are tested in pairs, and it is recommended that one of the pair be a templet gear. Both are mounted to revolve freely on arbors that do not revolve. One arbor is fixed in a carriage which is mounted on slideways on the bed and clamps in the desired position; this is the adjustable carriage. The other arbor is carried by the floating carriage which has a limited movement longitudinally on the bed and rolls on three steel balls.

At one end of the floating carriage is a spring plunger. The spring inside the plunger may be compressed by an adjusting screw fixed at the end of the bed. A regulating screw acts against the same end of the floating carriage so that the distance between the centers of the two gears may be adjusted.

A scale is attached to the adjustable carriage, and a vernier to the floating carriage, so that distance between centers may be measure to 0.001 in. Variations of the center distance or movements of the floating carriage caused by defects of the teeth or by eccentricity of the bore may be noted on the dial indicator carried at the end of the jig.

A recording device traces a line on the circular chart corresponding with the movements of the floating carriage, thus recording in graphic form the character of the gears.

Both the carriages are machined to the same level on the upper service to receive the special additional equipment for spiral, bevel and worm gears. The arbors for spur gears have taper shanks which fit in the sockets in the carriages, but are without collars so that the bosses of the wheels may rest on the facings provided which also serve as the zero face for vertical measurements. A high center attachment for spur gears consists of a vertical shaft mounted on the adjustable carriage on which slides an adjustable center, a corresponding center being carried in the socket in the carriage. It will admit wheels up to 11 in. in diameter and 18-in. long. Recorders cannot be used for spiral gears.

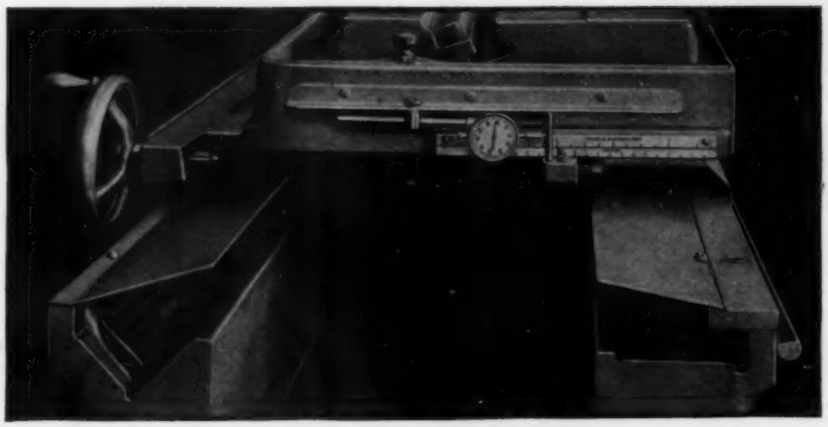


## Malsack Control for Swivel Table Grinders

The Malsack grinder control, announced by the Systematic Co., 709 South 36th St., Milwaukee, Wis., is applicable to any plain or universal grinder used for external cylindrical grinding and is of particular advantage in toolrooms on work with many and varying tapers or where frequent set-ups are required.

With the Malsack control, the usual coarse scale, with which all grinders of this type are regularly equipped, is supplemented by a dial indicator reading in thousandths of an inch. This indicator is located at the end of the swivel table adjacent to the scale. A chart is supplied for each grinder to enable the operator to make the adjustment quickly.

A swivel table grinder equipped with this indicator and chart requires the operator to take only a preliminary cut and two measurements, one at each end of the work, refer to the chart and then swing the table as many thousandths as shown by the chart. The amount of table movement can be gaged by means of the indicator. No computations need be made.



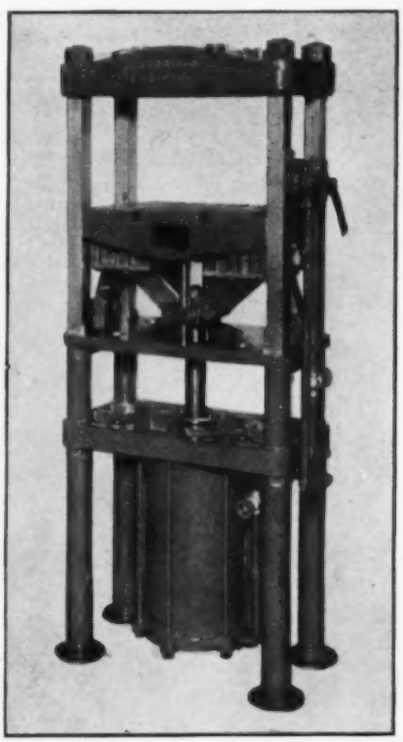
*The Malsack control is of particular advantage in grinding work with many and varying tapers or where frequent set-ups are required*

## Hannifin Molding Press

A 15-18 ton capacity air operated platen press for plastics and rubber molding operations has been announced by the Hannifin Mfg. Co., 621-31 South Kolmar Ave., Chicago, Ill. The design of this press provides an advance stroke at six times the speed of the pressing stroke. This advance stroke is 5½-in. at 5,000-lb. pressure, and the pressing stroke is 1½-in. at 30,000-lb. pressure. This cycle of operation permits rapid production, and one operator may handle the production of several presses.

Both hot and cold molding, rubber molding and several types of special molding operations are being performed on this press. Speeds and pressures may be regulated to suit the individual requirements of any particular molding work.

A feature of this press in plastic molding work is a provision for the use of maximum pressures to "break" or separate the molds on the reverse stroke. An air cushion at the end of the stroke prevents shock. Use of the ordinary shop air supply makes it unnecessary to install hydraulic pumps or special hydraulic power supply for molding work. This type of press, inverted, is made for bench mounting.



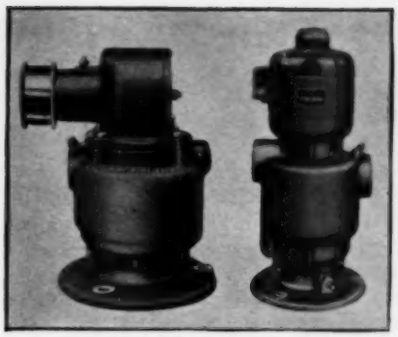
## Mascot Slide Rule

The Mascot slide rule, announced by the Tavella Sales Co., 25 West Broadway, New York, N. Y., is especially adapted for carrying in the vest pocket. The scales are finely graduated on white celluloid disks 2¾-in. in diameter, the length of the multiplication-division scale being 6.3 in.

It is claimed that the average error of the Mascot slide rule in making rapid calculations is within one-fourth of one per cent. The front side of the Mascot has four scales: log, C, D and CI or C inverted scale. The reverse side has sine and tangent scales and an A and D scale for finding squares and square roots.

## Williams "Non-Sparking" Safety Wrench

The "Non-Sparking" safety wrench, especially adapted for use in industries where great fire hazard exists, is announced by J. H. Williams & Co., 75 Spring St., New York, N. Y. The material used in these wrenches is beryllium-copper, drop forged and heat-treated. These wrenches are rust- and corrosion-resisting and are finished in green enamel with the head polished and the opening sizes stamped thereon. They are available in both single- and double-head patterns in a wide range of sizes. It is claimed that these wrenches are practically as strong as steel wrenches of similar design and size.



## Acme Sure Flow Pump

The Acme Sure Flow pump, introduced by the Acme Machine Products Co., Inc., Muncie, Ind., maintains prime without submerging part of the pump and can be installed at any convenient location on the machine with a single line of pipe running to the fluid reservoir.

Belt-driven models are available in 4-, 10-, 20-, 50- and 100-gal. per min. capacities; direct motor-driven models are available in 10-, 20-, 50- and 100-gal. per min. capacities. All models are manufactured for both low-pressure and high-pressure duty. Horizontal or vertical base for side wall mounting is optional.

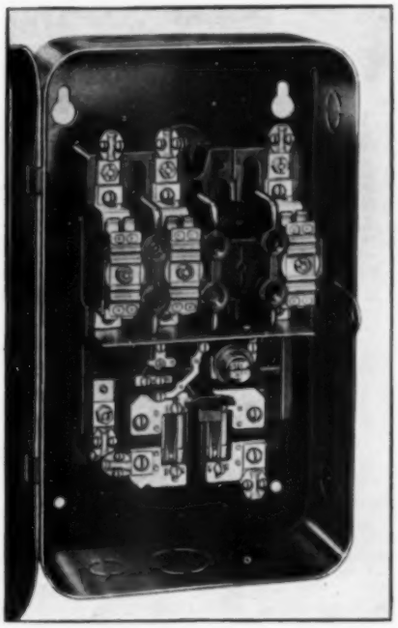
## Colt-Noark Type "MS" Switches

The Colt-Noark Type "MS" magnetic motor starting switches, introduced by the Colt's Patent Firearms Mfg. Co., Hartford, Conn., are made in two styles: local control, up to and including 7½ hp.; remote control, in two sizes, one up to and including 7½ hp., the other up to and including 25 hp. Either style is available for 25-, 50- and 60-cycle, a.c. motors in the standard voltage ratings. Each line is broken at two points, minimizing arcing. The mechanism is actuated by an electromagnet, and the self-adjusting contacts are kept clean by a wiping action as they seat.

Calibrated thermal relay heaters, mounted on the front of the switch block, control the switching mechanism. When a sustained overload occurs, these heaters react on a bimetallic thermostat which trips the switch, thus protecting the motor from injury.

The switching mechanism, mounted on Bakelite, is easily removable to facilitate wiring and may be mounted on a panel without the cabinet and with no further insulation.

*Above—Fourteen engaging jaws contribute to long life of the clutch. Center —A positive locking device in the throwout prevents accidental engagement. Below—Energy is transmitted by 26 splines*



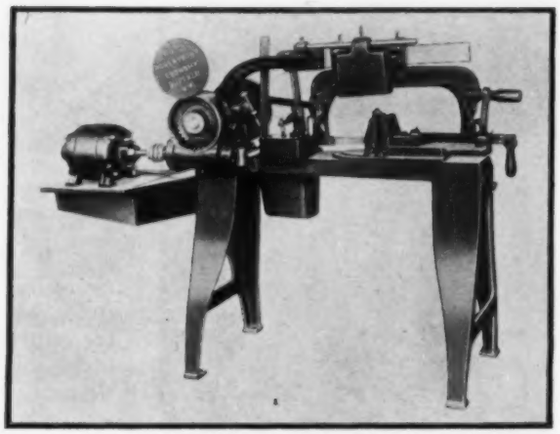
## Niagara Sleeve Clutch for Power Presses

Prolonged life, instant engagement, increased number of strokes per minute and added safety are the features which have been added to a fourteen-point-engagement, sleeve-type clutch announced by the Niagara Machine & Tool Works, Buffalo, N. Y. The shape of the fourteen engaging jaws provides for correct lateral acceleration of the clutch sleeve, positive, concentric driving grip and provision for absorbing backlash. When the clutch is engaged, the shaft is controlled in both forward and backward directions. The concentric application of the driving force eliminates the tendency to bind the sliding member against its guiding surfaces, and it avoids transmitting the shock of engagement to the clutch wheel bearing, thereby permitting the use of anti-friction bearings in the flywheel or main gear.

The hardened alloy steel clutch sleeve has fourteen jaws which engage with those of the wheel facing. When engaging or disengaging with the wheel facing, the clutch sleeve slides laterally on the crankshaft. When it is engaged, driving energy is transmitted to the crankshaft by 26 internal splines generated on the inside of the clutch sleeve bore. These are in constant mesh with the corresponding external splines on the crankshaft.

The crankshaft may be arranged to stop at, before, or after the top-center position, by mounting the clutch sleeve in the corresponding radial position. When the treadle is depressed, a large concentric spring slides the clutch sleeve into engagement. At the end of the stroke, the sleeve is positively withdrawn by a cam race machined in the sleeve, which is engaged by a hardened alloy steel follower spindle. To prevent excessive forward drift of the shaft if the brake should be too loosely adjusted, and to eliminate the possibility of repeating as a result of this, the throwout spindle encounters an abutment machined in the clutch sleeve which positively stops the shaft at the limit of allowable drift.

A positive locking device is built in the throwout to prevent accidental engagement of the clutch when setting dies. The clutch may be locked or released while the flywheel is rotating by simply turning a small handle in the front of the throwout. A single stroke, non-repeat device is a feature of the sleeve clutch. It prevents a second stroke of the slide, even if the treadle is held down. It must be raised and again depressed for the second stroke. This device may be disconnected.



*A projecting finger contacts a push-button switch and stops the motor as well as the frame, doing away with a clutch mechanism*

## Robertson "Economy" Hacksaw

On the No. 2 Economy motor-driven hacksaw, manufactured by the W. Robertson Machine & Foundry Co., Buffalo, N. Y., a complicated clutch mechanism is eliminated by a projecting finger which contacts a push-button switch and stops the motor as well as the frame. The electric motor is connected to the worm shaft through a flexible coupling. Gears are totally inclosed and run in an oil bath with a gland at the shaft end. All frequencies of electric current are taken care of by using only two sizes of worm gears.

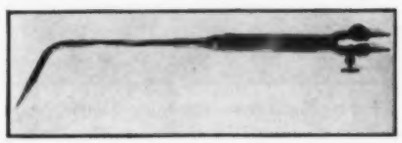
The machine has a 6-in. stroke with a capacity of 6x6-in. It uses blades from 12- to 14-in. in length. The device swivels 45 deg. for cutting at angles and is equipped with a hydraulic lift which relieves the blade teeth of all back drag. It also prevents the frame from falling on the work. Economy power saws are also made in sizes up to 13x16-in. and at different operating speeds.

## Westinghouse Total Time Meter

For totalizing running or idle time on electrically operated machinery, the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces the Total Time Meter. The meter registers hours and is suitable for any application where it is desirable to know the total number of hours during which a circuit is energized or apparatus is in operation. A registering mechanism having four dials registers 9,999 hours, approximately 400 days, before repeating.

This meter, including a self-starting, 120-volt, a.c., 60-cycle, synchronous motor, is contained in a two-piece Moldarta case, having a flange diameter of 3½-in. and an over-all length of 3¼-in.

A special register may be furnished providing one revolution per hour of the sweep hand. The sweep hand dial is then marked in ten main divisions each of which represents $\frac{1}{10}$th of an hour. This register reads up to 9,999.9, hours before repeating, and is particularly useful for production checks where it is desirable to obtain data in fractions of an hour.



## Linde Welding Torch

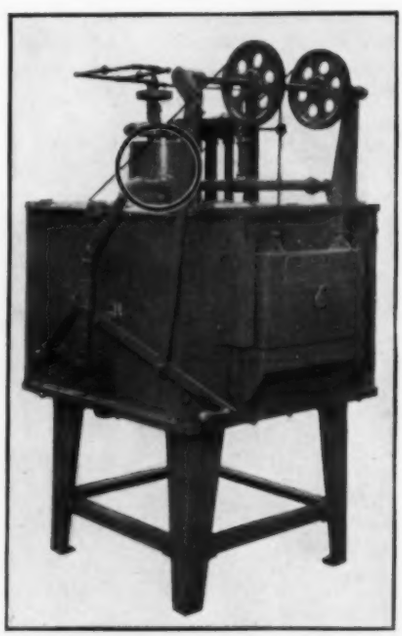
The Purox No. 35 general duty welding torch, announced by the Linde Air Products Co., 30 East 42nd St., New York, N. Y., is adaptable to the lightest as well as to the heaviest work to be found in most welding shops. It is constructed of extruded brass, Monel metal, and drawn copper, with silver soldered tubes.

The ribbed design of the extruded brass handle reinforces the torch and enables it to be easily gripped. Connections are ferrule-type and extend parallel to the axis of the handle. Individual mixers in each welding head are so designed that maximum resistance to flashback is afforded, and the effective range of each size tip is greatly increased. Nine tips perform the duty of fifteen, the number usually required. Monel metal seating surfaces are wear-resistant and easily removable for cleaning or replacement.

A hexagonal socket arrangement permits the welding head to be assembled in the most convenient of six optional positions in relation to the body. This prevents injury or scoring of the seating surfaces. The tips are of hard-drawn copper. They are of the right weight to withstand excessive heat and to maintain balance in the torch. The standard Purox No. 21 cutting attachment can be used with the No. 35 torch, transforming it into a light-duty cutting torch.

## Stewart Gasifier

A Gasifier unit, which may be used on any industrial gas-fired furnace, is being offered by the Stewart Industrial Furnace Division of the Chicago Flexible Shaft Co., Chicago, Ill. Oil is fed through the unit, which changes it into gas. Furnaces may be heated faster because of the preheating of the gas. The gasifier requires no additional floor space as it rests on a vent of the furnace. No change in the present function of the furnace is necessary and the same burners are used.



*The Gasifier, shown in the circle, converts oil into gas for gas-fired furnaces*

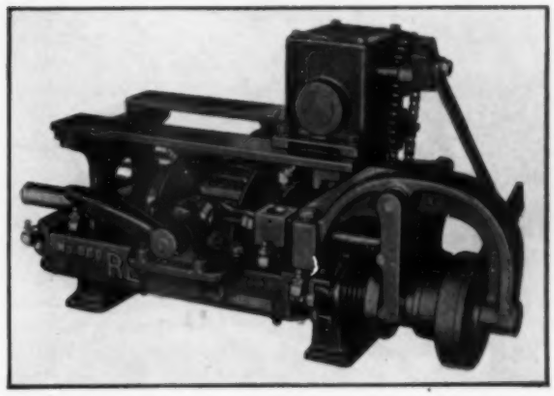
## Reeves Variable Speed Ratchet Control

The Reeves Pulley Co., Columbus, Ind., has developed a ratchet control for automatic variable speed regulation through the Reeves variable speed transmission. While this control was built for a special purpose, the principle is applicable to any requirement calling for gradual increase or decrease of machine speeds over a specific period of time.

The power input shaft of the variable-speed transmission is driven from any source of power and drives to a gear reducer of proper ratio through a roller chain. The output shaft of the reducer is connected by an adjustable arm to the ratchet which is mounted on an extension of the speed changing screw of the transmission. Increase or decrease in timing of the control is permitted by the adjustable arm.

When the speed range required over the fixed period of time is known, the ratchet may be set so that the transmission begins operation at either extreme of speed and at the end of the period has attained the other limit.

In the case of the unit shown, this variation produces 3⅛ turns of the speed changing screw in eleven hours and provides from 196 to 279 r.p.m. on the variable speed shaft of the transmission. When the extreme limit and end of run is reached, the transmission is shifted by hand back to the starting speed position and the ratchet is reset by the lever. Stop nuts on the screw at the right of this lever prevent the unit from over-running the extreme speeds.

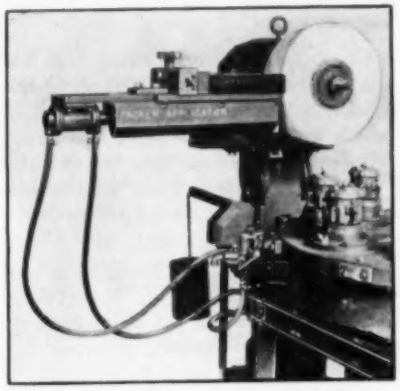


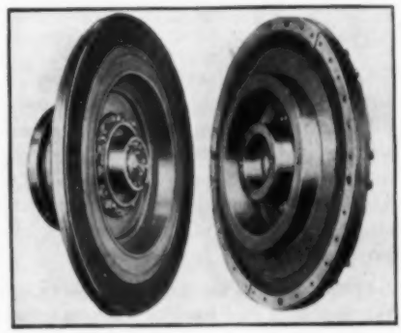
*The Reeves speed control is designed to vary speeds through a transmission between predetermined limits in a fixed period of time*

## "Hisey" Drill Grinder

A motor-driven drill grinder, announced by the Hisey-Wolf Machine Co., Cincinnati, Ohio, is designed for sharpening straight or tapered shank drills, 1-, 2-, 3- or 4-lip drills, flat or chucking drills, flat twisted drills and drills with over-size shanks. It is equipped with ball bearings throughout and may be adjusted for clearance and point angle.

Standard equipment includes one cup-shaped grinding wheel and one wheel for point thinning. The latter can be replaced with a straight face wheel for tool grinding with the use of a tool rest, which is supplied. The machine is made in two sizes, for direct and alternating current, one for drills No. 52 to 1¼-in. diameter and one for drills ⅛- to 2½-in. in diameter.





## Packer Buffing Composition Applicator

The Packer Machine Co., Meriden, Conn., has placed on the market an automatic applicator for feeding composition to the buffing wheels of polishing and buffing machines. Feed is automatic, and the operator has only to see that the applicator is supplied with composition in cake form. Maximum size of cake is 6 in. wide, 1½ in. thick and 11 in. long.

Jaws holding the cake can be adjusted to various sizes, smaller than maximum. Compressed air, at a maximum of 60 lb. pressure, provides the operating force. Each unit is provided with a reducing valve. The cam operation is governed by the travel of the work table.

## Cutler-Hammer Magnetic Clutch

An outstanding feature of the general purpose magnetic clutch, announced by the Cutler-Hammer, Inc., 205 N. 12th St., Milwaukee, Wis., is the method of adjusting the friction faces to compensate for wear and to assure uniform lining engagement. The inner circumference of the field ring is threaded and the adjustment is made by rotating the field ring in respect to the magnet field member, thus moving it toward the friction surface on the armature member. When the field ring has been moved forward sufficiently to compensate for the wear, it is locked firmly in position.

A floating magnet armature is used in the design of the clutch, making it impossible to score the magnet pole faces, even if proper adjustment on the lining is not maintained.

Other features of the design include a magnet coil which may be removed and replaced as a unit, a lining wear indicator, and a pilot bearing to insure concentric engagement.

## Milligan & Wright Floor Model Blueprinter

A floor model of the Angstrom lamp blueprinter, having a set-up for the washing and fixing trays and drying boards provided in the base, is announced by the Milligan & Wright Co., 4611 Prospect Ave., Cleveland, Ohio. These trays can be slid back into the base so that the floor space required is only 28x30 in.

The use of incandescent lamp means, inexpensive equipment, capable of being plugged into any 110-volt a.c. or d.c. line. This equipment produces prints with exposures of ¾- to 1½-min., depending upon the drawing and paper used. A time switch cuts off the current at the end of the exposure selected. This Model 200 has a capacity of one 18x24-in. print at a time.

# TRADE PUBLICATIONS

BEARINGS. The third edition of the Timken Engineering Journal has been issued by the Timken Roller Bearing Co., Canton, Ohio. The first four sections of this 260-page journal cover the design of Timken bearings with illustrations of the various types, a discussion of the method by which they are rated, the curves and factors which apply for speed, life expectancy and engine torque, use or application and fifteen typical examples of how loads are calculated and bearings selected for various applications. Detailed dimension sheet sections are preceded by a special index enabling the user to locate any bearing by series or number. Full and half-size illustrations, suitable for tracing are given for single row bearings. The last two sections of the journal discuss cup and cone fitting practice for Timken Bearings. Specifications for lubricants are given for a wide range of applications. Special sections on mine cars, conveyors, shop trucks, cranes, aircraft, machine tools and farm equipment are included.

BALL BEARINGS. The 10th edition of the catalog published by the New Departure Mfg. Co., Bristol, Conn., contains, besides a complete listing of new bearings, types and sizes, many helpful features for engineers and designers, such as: tolerances and mounting fits for standard, precision and ultra-precision bearings, bearing closure data, and approved methods of bearing selection.

CONVEYORS. "How to Handle It" is the title of a catalog published by the Chain Belt Co., Milwaukee, Wis., in which the various types of material handling equipment manufactured by this company, and their applications in certain industries are presented pictorially.

CUTTING OILS. The Socony-Vacuum Oil Co., 26 Broadway, New York, N. Y., has issued a pamphlet presenting performance records of its cutting and soluble oils used in a series of tests conducted by this company.

DIAMOND TOOLS. The F. F. Gilmore & Co., 112 Dartmouth St., Boston, Mass., has announced two folders describing its line of "Trumore" Diamond Tools. One of the folders is devoted to the Trumore Ball Joint Diamond Tool.

ELECTRIC HEATING EQUIPMENT. Struthers Dunn, Inc., Philadelphia, Pa., has issued a folder describing its line of Dunco electrically heated wax and compound pots, solder pots and ladles. Tables include a "Heat Absorption Calculator," heats of fusion, melting points, weights and temperature conversions.

ELECTRO-PLATING. The U. S. Galvanizing & Plating Equipment Corp., 27-41 Heyward Street, Brooklyn, N. Y., has published a 14-page booklet, "Methods and Equipment for Electro-Plating." Illustrations show plating installations for a variety of industrial applications.

GEARS. The Grant Gear Works, 2d and B Sts., Boston, Mass., has published a new edition of its catalog presenting its complete line of speed reduction units, gears and sprockets. The last 28 pages of this 154-page catalog are devoted to valuable data regarding spur and bevel gears.

GRINDERS. The Landis Tool Co., Waynesboro, Pa., has published a catalog, known as A-35, describing its line of Type D Plain Hydraulic Grinders. Features of construction are illustrated and described. Specifications are included for the 10, 14 and 16 in. sizes.

HOISTS. The Harrington Co., Philadelphia, Pa., has compiled, in catalog form, its bulletins presenting its line of chain and electric hoists, trolleys and cranes. Specifications and price lists are included.

IMPACT AND STATIC TENSILE PROPERTIES OF BOLTS. The National Bureau of Standards has published Research Paper RP-763, entitled "Impact and Static Tensile Properties of Bolts." The paper contains the results of tests on 360 specimens, representing all possible combinations of five different materials, four different bolt diameters and three different forms of screw threads. Copies of this paper are for sale by the Superintendent of Documents, Washington, D. C., price 10 cents.

LUBRICATION. "The Lubrication Engineer," published by the Standard Oil Co. of Indiana, 910 S. Michigan Ave., Chicago, Ill., is the first number in the series which will be sent to interested persons, and which, when complete, will quite thoroughly cover the lubrication problems of the metal-working fields.

MECHANICAL RUBBER GOODS. The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J., has announced publication of a new 56-page catalog covering its complete line of standard rubber products for industry. It contains list prices and several pages of information tables. Engineering data are included in detail on many of the products, notably belting.

POWER PRESSES. Joseph Hyman & Sons, Philadelphia, Pa., have ready for distribution an illustrated catalog of used power presses for sheet metal stamping.

SAFETY SWITCHES. The Electric Controller & Mfg. Co., Cleveland, Ohio, has published a folder presenting its type "A" safety switches. Illustrations show typical installations.

SHEARS AND PRESSES. Henry Pels & Co., 90 West St., New York, N. Y., has issued, in German, an illustrated booklet describing its line of shears and presses.

WIRE. The Wilbur B. Driver Co., Newark, N. J., has published its 1935 Resistance Handbook. Tables give wire sizes and specifications, and 9 pages of electrical engineering data are included.

# The Round Table

# WHAT ABOUT VACATIONS?

"Been laying off some men, Al? Shop looks a bit empty."

"No, Ed. It's vacations; and they are a problem. I'm hoping we can work out some real plan before another summer."

"What do you mean, plan? Men have to have vacations—or think they must. What good will a plan do?"

"Perhaps no good, Ed; then again it may do a lot. The problem is to satisfy the men and at the same time avoid interfering with the work."

"Is there anything new in that, Al? Hasn't it always been the same?"

"More or less, Ed, but there is a change in some cases. I've just read a report by the National Industrial Conference Board which covers nearly two hundred firms that have regular vacation plans."

"That's interesting; what is it about?"

"Well nearly all of them pay men at their full rate for the vacation. Most of them pay it in advance, a few after they get back."

"A man needs it before he goes, of course."

"But their idea is that he'll have a backlog when he gets home."

"How long do they give, Al?"

"Most of them a week—some two weeks. Many let them take more time at their own expense if they take it continuously. About twenty per cent of the firms shut up shop for one week, or two, and all have to take that as the vacation period."

"Which do you favor, Al?"

"I'm not sure, Ed. I rather like the idea of shutting the whole plant and getting all the vacations over at once."

"But suppose there's a rush order or a breakdown job? You can't let a good customer wait two weeks for men to get back from a fishing trip."

"That's one objection, of course. And yet some firms have done it for years. They have to keep a few men for emergencies in both office and shop but when the vacation period is over, they don't have to worry about anyone being away when they need him."

"I don't altogether like the idea, Al. I like to choose my own time to go, and it may not always be the same time of year."

"But you have to arrange dates with Williams or some one else. You can't just pick any two weeks you want. It's some job arranging vacation schedules in a big shop."

"It isn't so bad, Al. We give the older men first choice, and then fit the others around their dates."

"But you couldn't let all the planer hands go at once, no matter about priority or anything else. If you keep the shop open it has to give you a balanced output. That's why I favor having all vacations at the same time and getting the whole thing over with at once."

**Is it best to close the plant, as Al suggests? Or does it satisfy more people to string vacations through the whole summer?**

## DISCUSSION

### Five-Day Week

After having worked for several months on the five-day, 40-hr. week, I prefer it to the six-day, 40-hr. week. Everyone with whom I have discussed this matter prefers the five-day week. In one small shop that has adopted the shorter week, production has been maintained and a better product has been turned out, due to a better feeling among the employees.

The shorter week affords a saving in time and money for the employees, as it saves one trip a week to the shop, which in some cases means two hours' ride, plus carfare. It is also an advantage to the employers, as the week's work is finished one day, or at least half a day sooner than with the longer week, and a half day (Saturday) is left over in which to work overtime on any special rush job.

Ed's reluctance to accept a proposal from the men is an admission of ignorance on his part, especially when the proposed change would effect a saving to the company and make better working conditions for the men. Ed could display his authority to better advantage in other ways, such as demanding cleanliness, less wasted time and better care of tools and equipment.

—C. F. Staples.

Without a doubt a shop will turn out as much work in the five-day, 40-hr. week than when 40 hrs. are strung out over six days. There is a mental and physical drag in getting things

moving on "Blue Monday" morning whether we have a six-day week or a three-day week. At the starting whistle there are a few minutes lost time by everybody, even the piece-workers. The same is true of unavoidable losses just before the quitting whistle. The morning starting-up losses are far greater than the ones after noon. Also the quitting losses are greater on pay night. These losses will be greater the sixth day than on the fifth day.

Ed is too much like the automobile driver who has to do all the thinking and continuously control the dumb thing, while Al seems to have the common sense to let the horses amble along, merely guiding them at turns and cross roads and keeping them up to speed.

There is absolutely no basis for Ed's reluctance to accept a proposal from his men. On the contrary, there is every reason to accept it, as the men will move Heaven and earth to make the five-day week a success, even if for no other reason than they proposed it and don't want to be accused of pulling a boner. —E. E. GAGNON.

### Change in Design

While it is inconsistent to allow a little thing like finished or unfinished handwheels to interfere with a substantial order, actual departure from what has proved to be the best design is quite another mattear. One method of dealing with a customer who wants a change in design would be to offer to build the machine to his specifications with the understanding that it will not bear the maker's name, and that he will not be responsible for its performance. Such a stand will be enough to make most anyone think twice before pressing his demand further. Few folks want orphan machines in their plants under any circumstances.

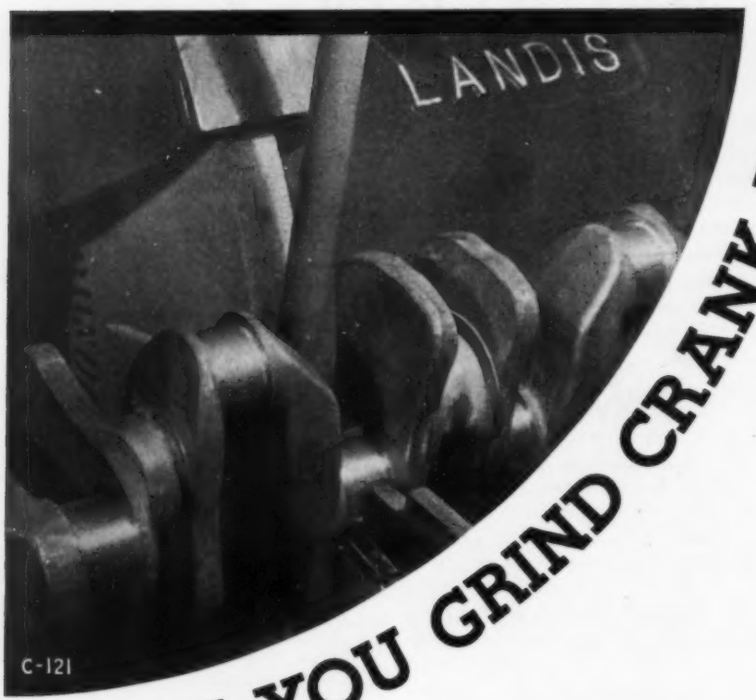
However, any suggestion for a change in design advanced by a customer should be given careful attention and, if it shows any promise, be given exhaustive examination before setting it aside as being impracticable. It is well known that most engineering departments will receive ideas from outside with unfriendliness and skepticism. When something better is developed they want to be the ones to do the developing, rather than let Bill Jones from no-telling-where into the limelight. —JOHN E. HYLER.

A change in design to suit a customer's requirements calls for a lot of consideration. The change will necessarily involve additional expense, which should, most certainly, be borne by the customer.

A change in design that impairs the efficiency of a machine or adversely affects its operation is not a good advertisement for the builder, and a piece of equipment that is not satisfactory brings down the reputation of its maker.

It is advisable that any machine in which changes have been made to suit the customer, have a nameplate stating that it is not of standard design, but was built to suit the customer's requirements. That will prevent the maker's reputation from suffering if the machine fails to give satisfaction to its buyer after being put into use.

—W. E. WARNER,
*Bromley Common, Kent, England.*


WHEN YOU GRIND CRANK PINS

**When you grind crank pins you are always striving for higher output, greater accuracy and better finish. As a very real aid in the securing of these ends we recommend the Landis 16" Type D Hydraulic Crank Pin Grinder.**

**Operators like this machine. A work center line only 36" from the floor makes easier the loading and unloading of heavy crankshafts. Seven machine movements are controlled by a single conveniently located lever. Safety features thoroughly protect both the operator and the machine.**

**These are only a few of the reasons why the Landis 16" Type D contributes so largely to economical manufacture and improved product. You should see one in operation to fully appreciate its possibilities.** 195

LANDIS TOOL CO.
WAYNESBORO, PA.

### Fine Feathers

Performance is the main point when the practical man is in the market for equipment because, no matter how well developed his artistic tastes may be, he realizes that while a thing of beauty may be a joy forever, it may not produce much in the way of dividends. Yet this same man will buy the better finished machine from a group selling at the same price and of average quality so far as performance and durability are concerned, so let us not decry the merits of trim lines and a neat paint job.

I have in mind an old timer who recently bought a new milling machine which, besides being modern in the productive sense, is a great treat to the eye of anyone who appreciates neat design and a clean looking paint job. When I admired the new machine he said, "Yes, it's a neat job, sure enough, but it's going to cost me more than I figured. You see it looks so darn good beside my other old standbys that I won't be happy until I replace them and brighten up the old place with a coat of paint."

—Robert S. Alexander.

The old saying "Fine feathers make fine birds" contains a lot of sense. Although Ed opposed the good finish on the pump, he was impressed by it, which indicates that Al is on the right track. An article that impresses prospective customers favorably is half sold, but an over elaborate finish may suggest unnecessary extravagance, or that it is intended to hide some weakness or defect.

A well finished article that suggests good design, good materials, good workmanship and refined beauty will be appreciated by people in general more readily than will a crudely finished article, which may be appreciated only by persons of special knowledge.

Since all extremes are mistakes, Al should be careful to restrain the finish on his pumps to that which is appropriate and is in reasonable harmony with developing preferences of the present time. The first effect of good finish is to create a commendable pride of workmanship, which passes from the workman to the employer, the salesman and the purchaser successively.

—L. Brown,
*Montreal, Canada.*

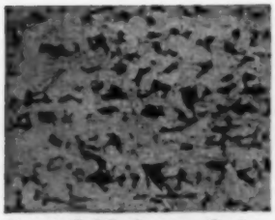
The finish that Al has tried on his pumps may be evaluated from several points of view. First, an attractive finish should be considered as a form of advertising; second, as a form of insurance that the pump will receive some measure of consideration during its life time; and third, as a source of pride to the workmen.

The sales psychology of the pump business probably does not differ fundamentally from that of other fields. Consequently, as an attractive finish has proved advantages in many fields, it will undoubtedly benefit Al's pump sales. An additional incentive for Al to finish his pumps attractively is that his competitors, whose pumps probably work nearly as well as his, may already finish their pumps attractively. Thus the finish may be the deciding sales point.

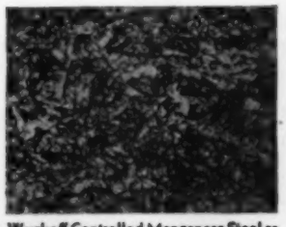
Furthermore, the final decision of the pump to be selected may be made by an executive who is fully as interested in appearance as in performance, and in fact may be inclined to take satisfactory performance for granted.

—S. D. Bryden, Jr.

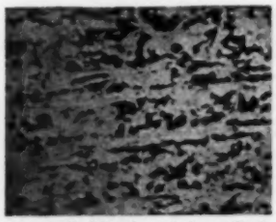

# WYCKOFF *Controlled* MANGANESE STEELS



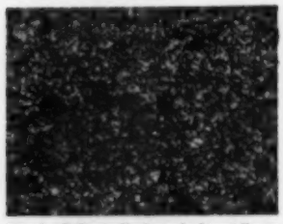
Uncontrolled Steel — magnification 67 x—etched.



Wyckoff Controlled Manganese Steel as rolled — Magnification 67 x — etched.



Uncontrolled Steel, cooled rapidly in air from 1900° F.



Wyckoff Controlled cooled rapidly in air from 1900° F.

In a recent series of tests conducted by a large eastern manufacturer, interested in obtaining a steel that would give maximum results in both uniformity and machinability, Wyckoff Controlled Manganese Steel, proved conclusively its superiority over the steels heretofore used as shown in the illustrations above.

In these tests, the superior machinability of Wyckoff Controlled Manganese Steel and its close grained structure were outstanding. After machining, it was further subjected to heating in Cyanide at 1450° F. and quenched in oil, definitely proving that its fine grain characteristics insured the MINIMUM amount of distortion.

Investigate Wyckoff Controlled Manganese Steel!

## WYCKOFF DRAWN STEEL COMPANY

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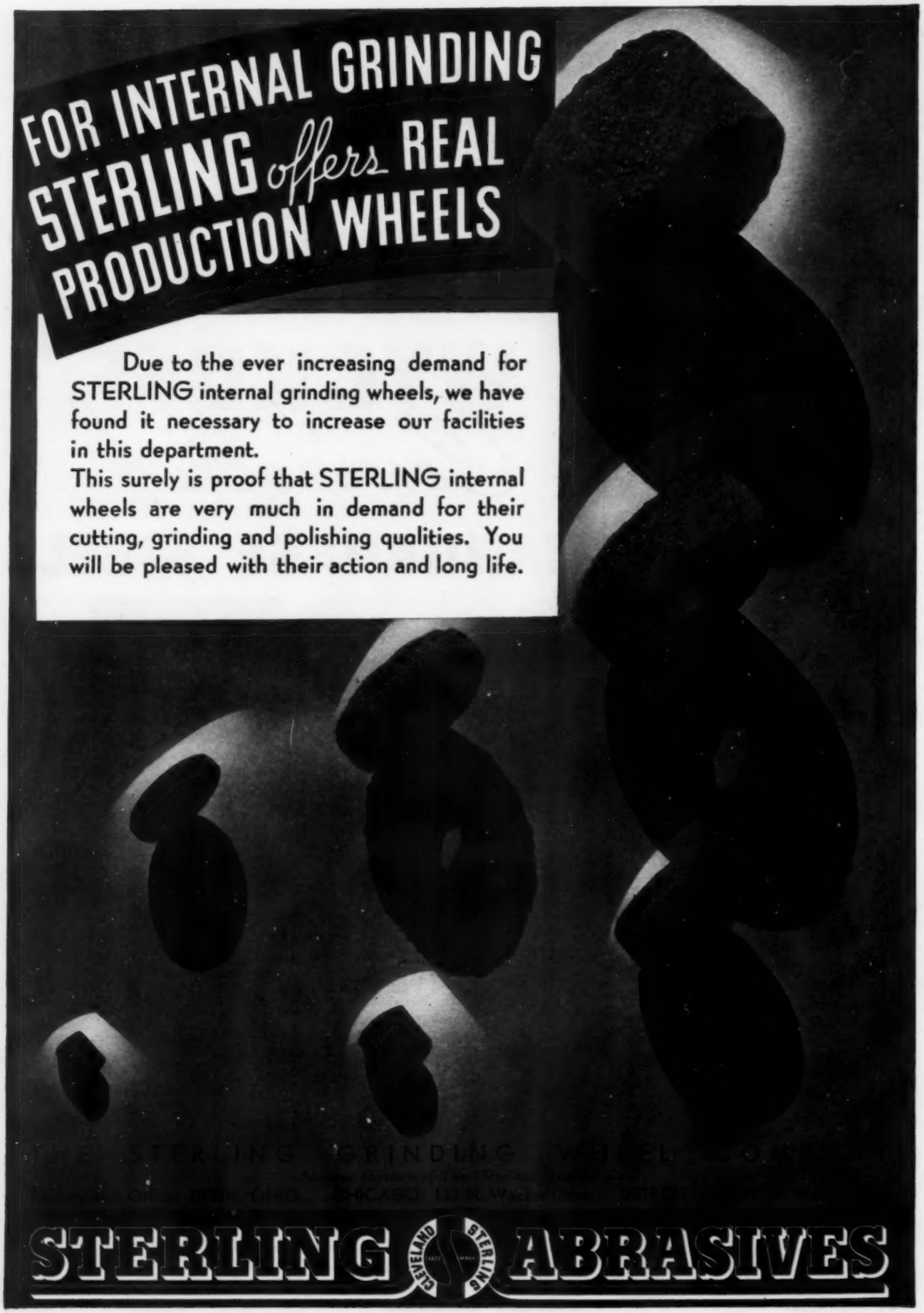
*Manufacturers of* Cold Drawn Steels
Turned and Polished Shafting — Turned and Ground Shafting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STERLING offers REAL
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Due to the ever increasing demand for STERLING internal grinding wheels, we have found it necessary to increase our facilities in this department.
This surely is proof that STERLING internal wheels are very much in demand for their cutting, grinding and polishing qualities. You will be pleased with their action and long life.
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